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A CASE OF MULTILOCULAR CYST OF THE OPTIC NERVE MENINGES — MARTIN COHEN AND LOUISE H. MEEKER

REPORT ON A CASE OF BILATERAL GLIOMA OF THE RETINA CURED IN THE NON-ENUCLEATED EYE BY RADIUM TREATMENT — MARK J. SCHOENBERG

THE PRINCIPLES OF SYPHILOTHERAPY AS APPLIED TO THE EYE — JOHN H. STOKES

VISUAL FIELD STUDIES IN A CASE OF OPTIC NEURITIS SECONDARY TO SINUS DISEASE — J. MILTON GRISCOM AND MARGARET M. MONROE

THE ORGANOLUETIN REACTION IN THE DIAGNOSIS OF INTERSTITIAL KERATITIS — DOHRMANN K. PISCHEL

ABSCESSES OF THE OPTIC NERVE — ALGERNON B. REESE

THE USE OF THE OBLIQUE MUSCLES OF THE EYE — GEORGE LINDSAY JOHNSON

A CASE OF ADENO-CARCINOMA OF THE UPPER LID, SUBSEQUENTLY EXTENDING INTO THE ORBIT — HERBERT WRIGHT WOOTTON

TREATMENT OF IRIDOCYCLITIS BY SUBCONJUNCTIVAL INJECTIONS OF ATROPIN AND EPINEPHRIN — FRANK H. RODIN

FATTY INFILTRATION OF THE ANTERIOR SEGMENT (XANTHOMATOSIS BULBI) — SANFORD R. GIFFORD

FAMILIAL MACULOCEREBRAL DEGENERATION IN HALF BROTHER AND SISTER — S. JUDD BEACH

(Complete contents inside)

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ARCHIVES OF OPHTHALMOLOGY.

A CASE OF MULTILOCULAR CYST OF THE OPTIC NERVE MENINGES.[1]

BY DRS. MARTIN COHEN AND LOUISE H. MEEKER.

(FROM THE DEPARTMENTS OF OPHTHALMOLOGY AND THE LABORATORIES, NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL, NEW YORK CITY.)

(With eleven illustrations, eight in color, on Text-Plates VII.–IX.)

THE necessity of determining definitely the cause of unilateral exophthalmos is frequently urgent; occasionally it is difficult or impossible. The following case report furnishes a clear illustration of this point, for the reason that the operation disclosed a large cystic mass, apparently of the optic nerve sheaths, which we were unable to diagnose previous to operation.

The patient is a colored boy, four and a half years of age, born in New York City. The parents are young. The mother has always been well; the father has tuberculosis. There are no brothers or sisters. The child was a full term baby. He had measles one year ago. On admission to the Post-Graduate Hospital, April 26, 1926, the mother stated that four days previously the child claimed he had been struck over the eyeball by the fist of another child, and on her return home that evening she noticed for the first time that the eyeball was markedly protruding, but without any sign of hemorrhage or redness or any complaint of pain.

[1] Read before the Section on Ophthalmology, N. Y. Academy of Medicine, October 18, 1926.

The sudden proptosis increased gradually, but it remained stationary for three weeks after admission to the hospital. The child is normal mentally, but appears badly nourished; the teeth are in poor condition; the head is of normal contour, showing no abnormalities. The cervical nodes are easily palpable. Otherwise the physical examination is normal.

Laboratory Report.—The urine was normal. The blood Wassermann reaction was four plus. The mother's Wassermann was also four plus. The von Pirquet reaction was positive. The X-ray of the orbit was normal; the X-ray of the chest was suggestive of tuberculosis. The hemoglobin, the blood count, the differential blood count, the blood platelets, the clotting and the bleeding time were all normal,—indicating absence of hemophilia or lymphatic disease. The temperature ranged from 99° to 101° F. The patient remained in the hospital for five weeks.

Eye Examination. When first seen the left eye was normal in every respect. The right eye vision equalled $\frac{20}{20}$ — emmetropic; the tension and field of vision were normal; the exophthalmos in this eye was 11*mm* (Fig. 1)—the right being 31*mm*, the left or normal eye 20*mm*. The right eye protruded straight forward; the motility was moderately limited downward and outward; the eyeball remained partially exposed upon closure of the lids. Palpation of the eyeball toward the apex of the orbit encountered a definite doughy resistance. No abnormality could be felt around the orbit; no bruit could be heard by auscultation over the eyeball,—eliminating a pulsating exophthalmos. The exophthalmos did not increase on bending forward or on coughing,—eliminating a possible cephalocele. The ocular conjunctiva was congested; the pupil was slightly dilated and reacted sluggishly to light. The fundus examination was normal.

From the clinical data two facts stand out for consideration, namely, the history of trauma and the congenital syphilitic infection. The traumatic history seemed at first to point to a subperiosteal hemorrhage, that is, a hematoma. As the mass was situated deep in the orbit, aspiration at that late date was inadvisable. From the strongly positive Wassermann in both mother and child, it also seemed that we were dealing with a luetic patient, having a possible retro-orbital gumma. On the other hand, we were aware that the exophthalmos might be due to some other cause, such as an optic nerve tumor of undetermined nature. The patient was given anti-luetic

ILLUSTRATING DR. MARTIN COHEN AND DR. LOUISE H. MEEKER'S ARTICLE,
"A CASE OF MULTILOCULAR CYST OF THE OPTIC NERVE MENINGES"

FIG. 1. Photograph showing the marked exophthalmus in right eye previous to operation.

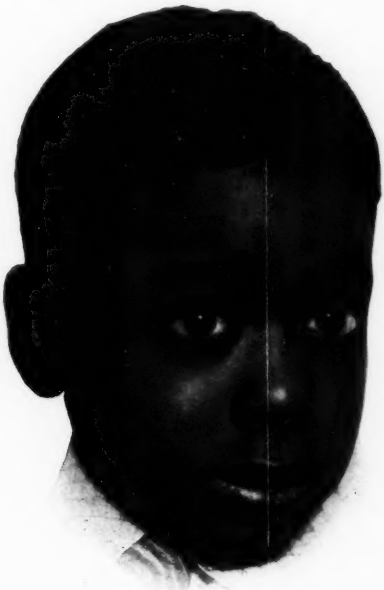

FIG. 2. Photograph 6 months after operation. Eye in normal position, complete recovery.

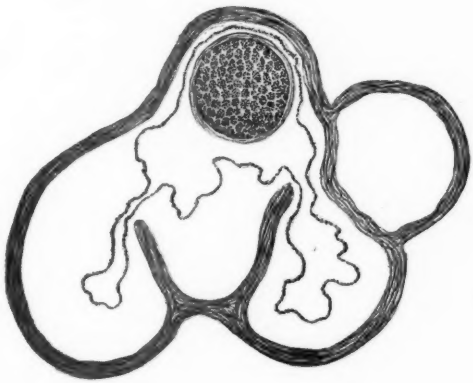

FIG. 3. Schematic drawing to illustrate the hypothetical defect in the optic nerve meninges that has permitted the ectasia producing the cyst formations.

UNIV. OF MICH.

treatment for four weeks,—but with no effect on the exophthalmos.

At a presentation of this case before the Ophthalmological Section in the spring, some of the members were of the opinion that we were dealing with a case of retro-orbital sarcoma.

After three weeks in the hospital, there appeared an ulcer at the lower portion of the cornea, with an increase of the congestion of the ocular conjunctiva and a slight increase of the exophthalmos, the fundus appearance remaining normal. The condition evidently demanded surgical intervention, as the growth would in time seriously affect the vision either by its extension or by its pressure on the optic nerve.

On May 30, 1926, I performed the Kronlein operation. The usual temporal curvilinear skin incision was made, with the separation of the orbital periosteum; an osteoplastic flap was then made with a chisel, and the peri-orbital tissue was opened. This procedure exposed a bluish ovoid fluctuating mass about the size of a hazelnut, situated deep inside the muscle funnel; the mass was mainly attached below by a pedicle near the optic foramen to the outer side of the optic nerve sheath. While removing the mass, a sudden gush of blood-tinged yellowish fluid occurred, which reduced its size, but I was able to remove it from its remaining attachment. The osteoplastic flap was then replaced and the periosteum and skin sutured. The cyst was sent to the pathological laboratory for examination.

The results of the operation were gratifying. On the removal of the first dressing, three days later, it was evident that the eyeball had receded to its normal position in the orbit —similar to the other eye. The congestion of the ocular conjunctiva and the corneal ulceration showed marked improvement.

A week later, before discharging the patient, examination of the eye revealed a complete disappearance of the exophthalmos; the vision, fundus, motility of the eyeball and the cornea were all in normal condition.

Ten months later, a slight keloid cicatrix became evident in the line of the incision; otherwise the eye was normal in every respect, with no indication of any recurrence (Fig. 2).

The cyst in the light of later findings was probably of

embryonal origin and due to a congenital defect or coloboma of the optic nerve sheath as represented in the schematic illustration (Fig. 3). This defect would permit the dura and arachnoid with its cerebro-spinal fluid content to advance from the inter-vaginal space into the orbit by way of a permeable canal or pedicle. Whether these congenital openings became occluded by the proliferation of embryonal tissue or became adherent from a prenatal pachymeningitis; the optic nerve structure and its visual function remained unaffected. The sudden exophthalmos may be explained by an increase in the cystic contents produced by the trauma in the congenitally luetic patient, causing the eyeball, by contact, to protrude straight forward.

The tumor measures 35 x 20 x 16*mm* and is fairly well encapsulated. The surface is covered by thick fibrous bands between which there are thinner portions cystic in character. These cystic portions are in part pale and translucent and in part opaque and purple in color. The inner structure is that of large irregular spaces divided by thin septa. Some of the spaces contain albuminous fluid, others contain blood and a few contain a mixture of albuminous fluid and blood (Fig. 4). (From this gross examination the tumor mass was called a lymphangioma.)

On microscopic examination the spaces are filled with coagulated albumin or blood. That the blood is due to the trauma of operation is indicated by the fact that the red blood cells are perfectly preserved. There are neither blood clots nor old blood pigment deposits. The septa are of fibrous tissue with widely separated nuclei. In places the septa are very thin and at other points are thick, with large fiber bundles irregularly placed. The spaces are lined with a single layer of endothelial cells for the most part (Fig. 5). Local thickenings encroaching upon the cavities appear to be formed beneath the endothelium by young fibroblasts (Fig. 7). Here there are newly formed blood vessels with accumulations of lymphocytes and plasma cells about them and polymorphonuclear leucocytes in their lumina (Fig. 6). A few similar foci are present in the septa (Fig. 8). No new growth of lymph vessels, no lymph follicles or muscle bundles are found at any point.

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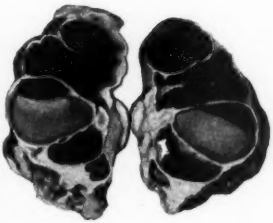

FIG. 4. Tumor-like mass bisected. (Slightly enlarged.) The cavernous type of the spaces is shown. The content is in part cerebrospinal fluid and in part blood.

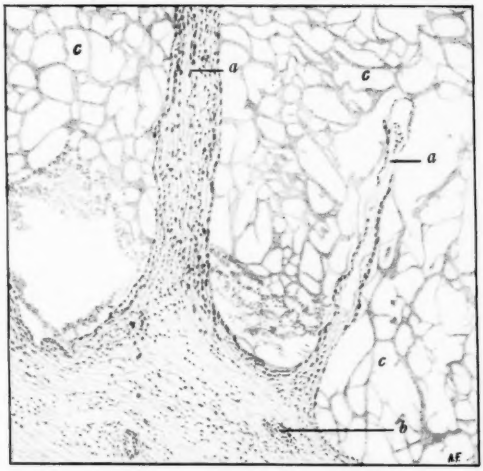

FIG. 6. Detail of V, higher magnification, (*a*) thin septa, (*b*) another type of inflammatory focus, (*c*) spaces in coagulated albumin.

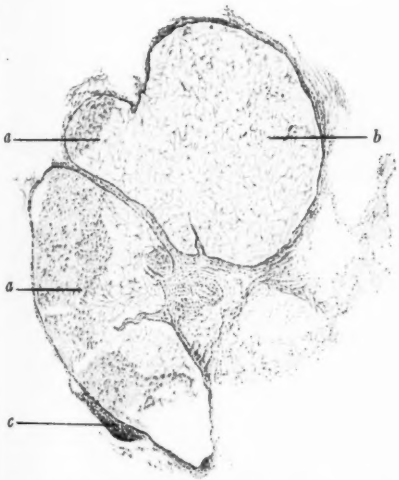

FIG. 5. Microscopic section low power. The spaces are lined by endothelium which rests on simple fibrous tissue septa varying in thickness, (*a*) blood, (*b*) coagulated albumin, and (*c*) focus of inflammation.

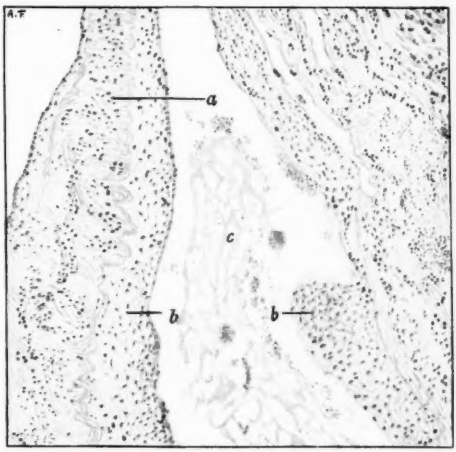

FIG. 7. Detail of thickened septa, high power, (*a*) coarse hyaline fibres, (*b*) proliferation of intima, (*c*) coagulated albumin.

One cavity contains a membrane made up of large endothelial cells (Fig. 9) many of which were filled with melanin granules, proven by special staining. This pigment failing to give the iron reaction, was bleached with permanganate and oxalic acid, did not stain with soudan III and was blackened with silver nitrate. That this membrane represents the arachnoid membrane in a colored subject seems inescapable. When the significance of this finding was understood the diagnosis lymphangioma was doubted. The Roentgen ray examination as well as the normal development of the eye rules out the meninges of the brain as a probable source. It seems that the spaces filled with blood and lymph are multiocular sacculations of the meninges of the optic nerve. The proper designation of the tumor mass was then difficult. It was a question whether the diagnosis "meningocele of the optic nerve" would be accurate or the title "multilocular cyst of the optic nerve meninges" appropriate.

This case so closely resembled the histological description and photomicrographs of a "lymphangioma" of the orbit recently reported by Franklin and Cordes (1) that we began a critical examination of all tumors included under that designation. It is only fair to state that Franklin and Cordes doubted that their tumor was a true lymphangioma and preferred the term "lymphangiectasis." This vacillation between the two terms is unfortunately very common. (See Adami (2), Kaufmann (3), Ewing (4), Fuchs (5).) P. Ernst (6), in Aschoff's *Pathological Anatomy*, illustrates a multicystic tumor of the spinal arachnoid under the term "lymphangioma." It seems more reasonable to ascribe the development of such cysts to the mechanical results of adhesive inflammation rather than to neoplastic proliferation.

Thirteen cases reported in the literature as primary orbital lymphangioma may be divided according to location. Eight lie outside the muscle cone and five within the muscle cone. Of the eight outside the muscle cone all were seen or palpated under the lid and were located above the eyeball or on the nasal side of the orbit, except two which were on the temporal side. They were wholly or partly encapsulated. Three of them had extensions toward the nasal side of the orbital fissure and refilled several times after puncture. Several

were entirely free in the orbit and these we believe are examples of meningoceles cut off from their pedicle, as described by Sick (7), Peters (8) and very recently by Marzio (9) and Aulamo (10). Although the descriptions are meager all the tumors outside the muscle cone can be identified either as meningoceles or extensions of lid lymphangiomas. Niosi's (11) case is a flagrant example of such meningoceles and to the lid extensions must be added the cases reported by Michel (12), Studener (13) and Sachs (14).

The five tumors within the muscle cone were of greatest interest to us. They are the "lymphangiomas" reported by Forster (15), Ayres (16), Wintersteiner (17), Kann (18) and Fehr (19). All were encapsulated and three were free in the muscle cone but slightly adherent to the optic nerve. These three could easily be classified as possible meningoceles cut off from their primary pedicle. They differ from the usual meningocele of the orbit in that the associated eyes were well developed. No knowledge, however, of the orbital sutures was available since radiographic information was lacking in every case. Two so-called lymphangiomas of the orbit remain for special consideration. One of these, reported by Kann, was united by an extension to the upper temporal fornix anterior to the recti muscles where we believe it originated beneath the conjunctiva. If this was a true lymphangioma it was not primary in the orbit. The remaining case, that of Wintersteiner, is the most difficult and the most important to bring into line with our hypothesis. There was a transparent, cystic swelling in the upper lid extending under the orbital margin nasally. This collapsed on puncture and was impossible to extirpate. Filling the muscle cone was a lobulated cystic mass with an extension passing between the muscles to the upper and inner orbital wall but not demonstrably connected with the cyst in the lid. The cystic mass within the muscle cone surrounded the optic nerve and was continuous with the sheaths of the long posterior ciliary arteries. For this latter reason Wintersteiner called the tumor a lymphangioma. No information about the orbital wall is given. The associated eye was fully formed and we believe that Wintersteiner was dealing with two defects both originating at the same time before birth, and in an area of

the brain meninges adjacent to and including the optic stalk. The anterior lid tumor conformed perfectly to meningoceles appearing in the lids. The cystic mass encircling the optic nerve corresponded to an anomaly seen in many eyes. We refer to the splitting of the dura into several layers near the bu b in the region of the posterior ciliary arteries, these layers separated by open spaces, a condition emphasized by Salzmann (20) and elaborated by Elschnig (21). To these anatomical vagaries an inflammation has been added after the manner described by Sick or the inflammation has preceded the anomaly if we follow Spring's conception of meningocele formation. Spring (22) maintains that an initial cystic pachymeningitis occurs in all cases. The cysts that have been described are filled with cerebro-spinal fluid to which blood is occasionally added by accident. Smooth muscle bundles may be found in the septa but do not indicate lymphangioma for it is a striking fact that all the descriptions emphasizing the presence of smooth muscle bundles in the septa are of tumors either situated anteriorly in the orbit beside the eyeball or which have processes in that region or further forward. This is a region abundantly supplied by smooth muscle as demonstrated by Hesser (23) in the fascia about the eyeball in man.

Our own case can be explained somewhat as follows. The eye is normal indicating normal development beyond the time of the closure of the fetal cleft in the primary optic vesicle and stalk and beyond the fusion of the pia and filling in of the nerve stem. This is at about the fortieth day, Seefelder (24). Between this date and the laying down of the bony orbit something occurred to alter the orderly formation of the arachnoid and dural sheaths of the optic nerve. They may have suffered inflammatory changes and produced a cystic pachymeningitis such as described by Spring and in this case confined to the optic nerve meninges. This subsided leaving a defect along the line of the optic nerve cleft. This possibility is strengthened by the evidence of congenital lues. What rôle, if any, injury may have played in the later formation of the cyst is not clear.

It seems more than an accident that the other cases within the muscle cone are also associated with fully developed eyes.

Cases of microphthalmus associated with meningocele are simply expressions of inflammation earlier in the life of the embryo. Many of the microphthalmic eyes have cysts at the scleral end of the optic nerve, *i.e.*, defects of the primary optic vesicle. Bergmeister's (25) case reported in 1913 is considered notable because in a microphthalmic in which optic development was arrested at the stage of the primary optic vesicle bilateral cysts of the orbit were found. He was able to demonstrate with ease that these cysts were the distended optic nerve sheaths attached to the full length of the elongated rudimentary optic stalk. Subsequent writers refer to his report as something new in the development of orbital cysts, meaning that the recognition of the rôle played by the optic nerve sheaths dates from Bergmeister's observation. Our case is the first cystic tumor within the muscle cone of the orbit to be described since the appearance of his paper.

Before summing up it is necessary to emphasize that the designation "lymphangioma" should apply only to true neoplasms formed of, or tending to produce lymph vessels. No lymphatics have been demonstrated in the orbit of man except those relating to the lids and about the lacrimal gland. This has recently been stressed by Whitnall (26). Sattler (27) doubts the existence of lymphangio-endotheliomas as primary growths in the orbit for this very reason. The objection has been raised by others. On the other hand, there is ample anatomical and embryological basis for the explanation of the occurrence of cysts in this region. Our case is a combination of embryonal defect with inflammation and ectasia of the optic meninges.

Summary.

1. No primary lymphangiomas of the orbit have been proved to exist. The evidence is too meagre and other possibilities have not been sufficiently investigated.

2. The optic nerve meninges bear the same relation to multilocular cysts of the orbit within the muscle cone as do the meninges of the brain to cysts outside the muscle cone.

3. We believe that a descriptive term such as "multilocular cysts of the optic nerve meninges" to describe such

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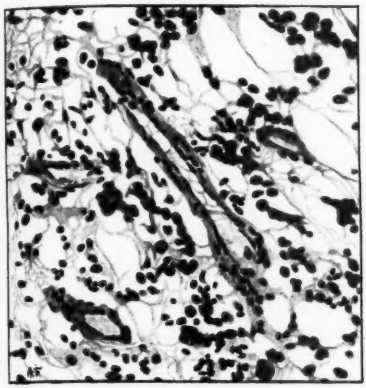

FIG. 8. High power of typical inflammatory focus showing lymphocytes, plasma cells and polynuclear leucocytes.

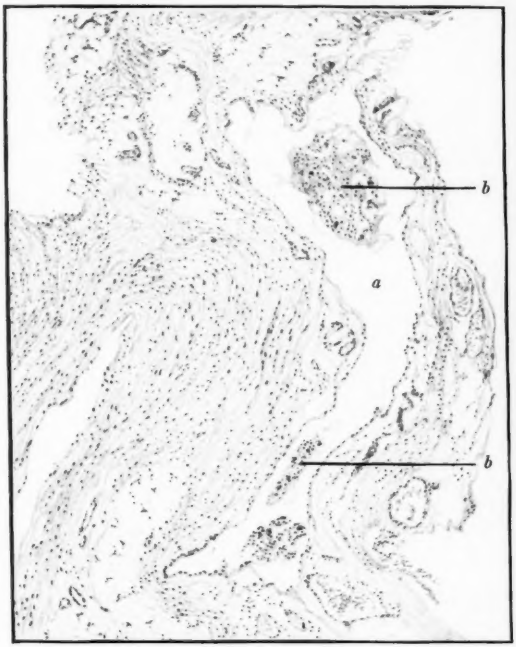

FIG. 10. Detail of IX, higher power, (*a*) space with (*b*) arachnoid folds.

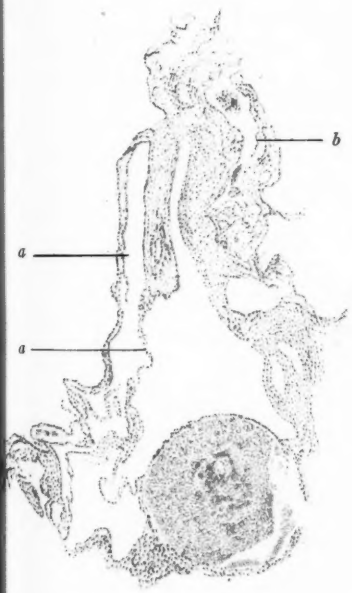

FIG. 9. Microscopic section of another portion of the specimen, (*a*) empty spaces, (*b*) space containing arachnoid folds.

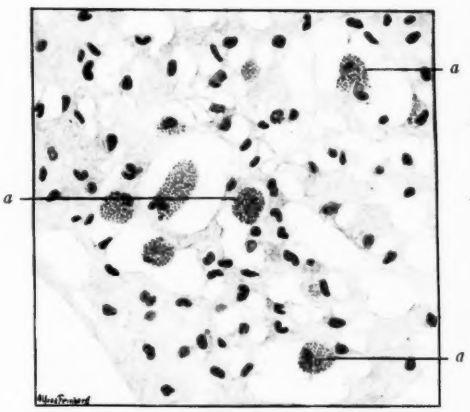

FIG. 11. Detail of X, high power of arachnoidea, (*a*) endothelial cells with melanin granules.

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cases as ours is preferable to the common practice of including them erroneously among lymphangiomas.

4. The term "meningocele" may be applied whenever hernia of the arachnoid can be proved.

5. Our case is the only one recorded within the muscle cone in which the arachnoid has been found or identified.

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REPORT ON A CASE OF BILATERAL GLIOMA OF THE RETINA, CURED IN THE NON-ENUCLEATED EYE BY RADIUM TREATMENT.[1]

By Dr. MARK J. SCHOENBERG, New York.

THE case herein reported presents a number of features of unusual and almost unique interest. They are:

I. This is the first case on record of bilateral glioma of the retina treated by radium and observed for ten years, that recovered useful vision.

II. A cataract which developed during this time has been successfully removed.

Alice W. came under my observation on March 16, 1916, when she was two years of age. Her mother had noticed that when the child was only one month old, "the shine of the pupil of the left eye was different than it ought to be." No attention was paid to this condition until a few days before calling on me. Examination revealed a typical clinical appearance of a glioma of the retina of the left eye. Almost the entire vitreous was replaced by the gliomatous mass. The other eye also showed a mass adjoining the optic nerve and extending from it downwards and nasally. Personal and family history negative; no history of an infectious disease or of trauma. Physical and serological examinations, negative. Von Pirquet, negative.

On March 17, 1916, the left eye was enucleated and while under the influence of the anæsthetic the right eye was carefully looked into. There was then found a sharply circumscribed, grayish white tumor of the retina, of about 6D. elevation, limited above and below by branches of the

[1] A preliminary report on this case was published in the *Archives of Ophthalmology*, 1919. The patient has been presented before the Eye Section of the New York Academy of Medicine in May, 1919, and again in October, 1926.

central retinal artery, occupying an area a little larger than a quadrant of the eyeground, extending from the margin of the disc nasally and below, towards the periphery, but not reaching the latter. This area was surrounded on all sides by patches of choroidal atrophy with pigmented borders. On its central portion were two small whitish spots of degeneration. Above, way over to the periphery of the fundus there was another grayish mass occupying an area of about 4–6 disc diameters. Tension normal.

Prof. J. Ewing (Dept. of Pathology, Cornell University Medical College) had the kindness to examine the enucleated eye and reported as follows: "Typical glioma of the retina. The tumor is composed of very small cells, consisting chiefly of nuclei, sometimes arranged in small rosettes and quite characteristic of glioma retinæ." A few days after the enucleation the child was referred to the General Memorial Hospital of New York where it received a course of treatments with radium. On April 10, 1916, first radium treatment: radium emanation 36 millicuries with lead filter, applied to right temple for four hours. On Sept. 22, 1916, second treatment: 58 millicuries, held over the eye at a distance of 1*cm* for eight hours and filtered through a 4 sq. cm. lead plaque. On June 7, 1918, a third radium treatment was given: 209 millicuries over the right side of the orbit, kept for fourteen and one half hours, filtered through plaques of lead 2*mm* and silver ½*mm* thick.

Repeated fundus examinations were made during the following three years not only by the writer, but also by Drs. C. W. Cutler, A. Knapp, J. Weeks, May, Tyson, Denig and the late Dr. Otto Schirmer. On March, 1917, the condition was found as follows: Optic disc distinctly visible, sharply outlined; temporal half somewhat pale. Vessels normal; nasal and lower branches appear slightly enlarged. There is a large whitish area occupying the nasal lower quadrant, reaching with one angle nearly up to the margin of the optic disc and stretching towards the periphery at a distance of about 20 disc diameters. The color of this area is slightly yellowish gray. There is a number of sharply outlined, lighter yellow spots present, especially in the lower nasal angle of the mass. The whole mass is distinctly prominent but much less than at the first examination. The outlines are not sharp, rather cloudy. The whole mass is surrounded nearly entirely by old choroiditic spots, consisting of white sharply outlined patches, surrounded by pigment or containing pigment. When the child looks straight upwards, one sees rather near the periphery another large yellowish gray mass of about 10DD. The vessels

going to this mass are considerably dilated and tortuous. The appearance of the mass in color and outline is the same as in the lower one. No choroiditic changes around this mass.

May 22, 1918. Patient feels and looks well. Names small pictures at a distance of 6–8 feet. The lower growth is about 6D. high. It shows three glistening whitish spots of retinal degeneration on its central area and a portion of an arterial branch running horizontally across it for a distance of about 3–4DD. The mass gradually slopes down towards the area where the choroidal patches are. The upper growth shows no choroidal changes surrounding it.

Sept. 30, 1918. Patient weighs forty pounds, feels and looks well. Upper growth possibly a little larger. Posterior portion of lens, very near the pole shows a pellicle-like opacification, surrounded by dust-like fine opacities, scattered in the posterior layers.

Nov. 11, 1918. Gaining weight (47 pounds), V. $\frac{20}{100}$ plus. The lower growth seems lobulated, white, smaller in extent but apparently elevated, it partly seems to cover the lower and inner $\frac{1}{3}$ of the disc. The mass looks now more like an exudate, whitish, silvery, prominent, soft. Tension normal.

Dec. 5, 1918. A circumscribed circular opacity at posterior pole of the lens surrounded by dusty opacities. Vitreous clear. Some vitreous opacities covering the retinal mass. The latter consists of an irregular, lobulated area, apparently very slightly raised, of white color, over which blood-vessels run. Some of these white masses have glistening white areas of degenerated portions of retina. The mass is surrounded by patches of choroidal atrophy. At the extreme upper and nasal periphery there is a similar process, very much smaller in size?

In June, 1919, the condition was the same. The child looks and feels well. The opacities in the lens appear slightly more dense. The fundus appearance did not change. The impression is gained that all that was left of the glioma is a degenerated necrosed mass. As to the upper focus, the appearance is about the same, but being situated at the extreme periphery, it cannot be examined any length of time (the child does not keep quiet long enough.)

Sept. 18, 1919. General appearance good, vision $\frac{20}{100}$.

October 10, 1919. Lens of (pearly) white color. In the anterior layers there are very fine dusty opacities. In the posterior layers, dense, pellicle-like opacities at the posterior pole. No floating opacities in the vitreous. Fundus, white silvery mass lobulated, turbid, smaller in extent than at the previous examinations, surrounded by a broad pale area

of choroidal atrophy with pigment. No blood vessels on the surface of this mass. The upper mass has the same appearance as the lower one, but is not surrounded by choroidal changes.

Feb. 9, 1920. Vision fingers at 3 feet.

Sept. 19, 1921. Cornea shows a few fine striated opacities above. Tension normal, anterior chamber normal. The lenticular opacities are more numerous and dense; the anterior capsule shows a thickened irregular square in its center, about 3*mm* in diameter. Fundus cannot be seen any more.

Feb. 22, 1922. Blood vessels of bulbar conjunctiva engorged, bluish; sclera, porcelain white, numerous new-formed dilated tortuous small blood vessels in the conjunctiva and in the episcleral tissue. This picture is very much like the one following superficial injuries after radium treatment.

Jan. 11, 1924. General condition good, is doing well in school. Memorizes with ease whatever she is taught. Lens appears as a membranous cataract, V.L.P.; projection good.

May 17, 1926. Operation for cataract under general anæsthesia. After the usual keratome incision a large piece of capsule was removed with a capsule forceps. A slight iris prolapse necessitated an iridectomy. The following day little cortex and quite an amount of blood were found in the anterior chamber. The blood resorbed within 48 hours, but it reappeared a few days later. The eye recovered gradually and on Sept. 20, 1926, her vision was $\frac{15}{100}$ with a plus 11. sph. The general condition is good and the patient can again take care of herself and can keep up the work at school fairly well. The fundus changes were the same as found at the previous examinations before the cataract had developed. There was no indication of any active process going on in the anterior segment of the eyeball, nor in the retina and choroid.

This closes the chapter on this patient's history—interesting for the various reasons mentioned at the beginning of this paper.

There still remain a few questions to be shortly discussed. Would the glioma have receded spontaneously even without the aid of Radium?

There are a number of cases of spontaneous recession of glioma retinæ reported in the ophthalmic literature. Wintersteiner speaks of a temporary arrest or recession of glioma retinæ followed by an atrophy of the eyeball. The cause of the

shrinkage, he said is mostly an intense inflammatory process, like panophthalmitis or plastic irido-chorioiditis. Sooner or later however the mass begins to grow again and the eye is destroyed. Parsons has collected 15 cases of retinal glioma that ended with a shrunken eyeball. He speaks of temporary retrogression of the tumor which however is only of short duration. Lagrange has collected from literature, 21 cases which showed partial or complete atrophy of the eyeball. The cases of Tyrrell, Rolland, Knapp, Grollmann showed alternate tendencies to shrinkage and growth.

Collins and Mayou have this to say on the subject: "In rare cases an eye affected with glioma retinæ, instead of becoming glaucomatous and enlarged, shrinks and the progress becomes arrested. The cause of this is not known. It may be a blockage of blood supply or the occurrence of some intercurrent inflammation starting in the uveal tract, the toxins acting on the cells of the growth.

The more recent literature (after 1910) contains reports on spontaneous recession of glioma retinæ by Clara Knieper, de Kleijn, Berta Lindenfeld and Rados. But the recession was accompanied by a shrinkage of the eyeball and complete loss of vision.

On the other hand, there are also reported a few cases of spontaneous permanent recession of glioma retinæ with conservation of useful vision. Purtscher has published two cases in one family with glioma prevalent in several generations Three members had died from glioma. Two examined later in life showed yellowish white areas in the retina, some flat and atrophic others more elevated and nodular surrounded by pigment. These were interpreted by Fuchs and Purtscher as spontaneously recovered glioma. (There was no microscopic confirmation.)

Meller reported in 1915 and 1922 on two cases. One was similar to Purtscher's case, but the lesions were larger, more nodular and vascular. In the second case, that of a child four years of age, one eye was enucleated and the clinical diagnosis was verified by the aid of the microscope. In the other eye there were found several yellow nodules with tortuous vessels running over them. The nodules grew in size. The patient disappeared and came back again four

years later. Then the nodules were found to have been replaced by flat, chalky white atrophic areas and vision.

Siegrist presented before the Heidelberg congress of Ophthalmology an eye with glioma retinæ enucleated from a child 3½ years of age. The other eye showed above the macula a round zone, grayish 5DD. and with its central area whitish and nodular. Vision apparently intact; at the periphery there was also a small mass. One year later the central area of this patch was whiter and the nodules had disappeared. Acuity of vision 0.6. Siegrist thought that this was either an inflammatory process or a glioma in process of spontaneous recession. The patient remained under Siegrist's observation for 10 years.

Of these five cases of spontaneous cure, three have no microscopic diagnosis and cannot be accepted as beyond any doubt. The others (one of Meller and one of Siegrist) are no doubt genuine cases of spontaneous recession with conservation of useful vision. The only important difference between these cases and the one herein reported is the considerable size of the tumor and the early age of our patient.

Outside of the eye, cancer may, though on rare occasions—recede spontaneously. Ewing admits that progressive fibrosis brings some cancers of the breast to comparative quiescence and the menopause has been followed by the spontaneous regression even of cancer of the breast. Some malignant tumors shrink on account of nutrition being cut off by constriction of the pedicle or obstruction of the blood vessels.

Since 1914, when Axenfeld first reported on his case of bilateral glioma of the retina with a temporary arrest of development of the tumor occurring after X-ray and Mesotorium applications, a number of authors have published their experiences with similar cases. In Axenfeld's case the tumor showed signs of complete arrest, but 1½ years later, when the lens had to be removed on account of a cataract, the vitreous was found to contain white floculi. Later on a complete detachment of the retina appeared and soon after, the eye had to be enucleated (on account of a perforating ulcer with prolapsed iris). The enucleated eyeball showed a recurrence of the gliomatous tumor with viable glioma cells. Another case of retinal glioma of Axenfeld had also a disastrous ending.

v. Hippel, Uhthoff, Birch Hirschfeld, Kussama, Pleikert Stump, Knapp, Janeway, Jacobi have reported on cases of glioma retinæ treated by X-ray, radium or mesothorium; but their results were only a temporary arrest of the gliomatous growth. The reports published by Ormond, Marx and Duncan are too recent (less than three years under observation) to warrant any definite conclusions.

There is only one case in literature, reported by Verhoeff, a bilateral glioma retinæ in which the microscopic diagnosis has been verified after the enucleation of the worse eye, and whose better eye, with a very small mass in the retina, was successfully treated by the aid of X-rays. The patient had a vision of $\frac{1}{1}\frac{0}{0}$ plus, seven years after the first X-ray treatment and the tumor mass (or its remains) was still visible, practically unchanged in appearance (from a private communication from Dr. Verhoeff).

A careful perusal of the case histories of patients with glioma retinæ leaves one with the following impressions:

a. There are cases which do not respond to any method of X-ray or radium applications. Possibly, a modified technic or treatment in the earliest stage, when the tumor is still very small, may prove more successful.

b. There are eyes which heal spontaneously after they go through a severe inflammatory process. But these eyes, almost invariably, are finally atrophied and remain a total loss, as far as vision is concerned.

c. "Somewhere midway between the complete resistance to irradiation and the tendency to spontaneous cure of the tumor—says Axenfeld—there must be a group of retinal gliomas that will respond more or less readily to X-ray or radium treatment." As a proof will serve the relatively numerous cases mentioned above which showed a temporary improvement or arrest of development of the gliomatous mass after irradiation treatments. Also the case of Verhoeff and the one reported in this paper, which made a complete and permanent recovery remaining with a useful vision.

d. The X-ray and radium treatment constitutes a distinct danger to the lids, conjunctiva, cornea, lens and the blood vessels of the bulbar conjunctiva and of the iris. The lenticular opacities appearing one or more years after the raying

treatments are characteristic and constitute a very interesting problem for the therapeutists. The recurring hyphæma following the cataract extraction in the case herein reported speaks for a vascular degeneration of the iris tissue—due to raying treatments.

e. There is no danger of damage done to the brain tissue from raying of these children. My own patient, Dr. Verhoeff's, as well as those of others showed no immediate or late signs of mental impairment.

The main points gained from a study of the literature on these sort of cases are: *To make in every case of bilateral glioma retinæ a very careful fundus examination of the apparently good eye—preferably under a general anæsthesia and to repeat this examination every few months, (the extreme perifery of the fundus deserves particular attention); to use X-ray or radium in massive doses without delay, on the better eye, as soon as a small mass is discovered in the retina; to keep a very careful record of the case and publish it after a lapse of three or more years.*

A complete bibliography up to 1926 is to be found in H. ttler's monograph *Die bösartigen Geschwülste des Auges.*

THE PRINCIPLES OF SYPHILOTHERAPY AS APPLIED TO THE EYE.[1]

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THE effective treatment of syphilis suffers today from a variety of defects or shortcomings, all more or less inevitable in the growth of the specialty of syphilology from the diffuse half knowledge of the clinical era of the 19th century. The tradition of the syphilotherapeutic methods of the past century in which many of us were trained is one of simplicity and universal ease of application. The actuality at the present day is one of technical difficulty and highly special selection and judgment. The traditional syphilotherapy is regional, the interest of the old-time therapist primarily in the healing of a local lesion. Yet one can almost grade the calibre of a genuinely modern syphilologist by his ability to envisage and effectively manage the entire disease in any individual patient, rather than the excessive deflection of his interest by any one particular lesion. By the same sign, specialists in other fields make comparatively ineffective syphilotherapists today, for their point of view is apt to be local and restricted, their attention focused on a perhaps isolated manifestation, their technical equipment limited, their estimate of results in the broad sense rendered partial and unreliable by what they see happening or failing to happen in a single structure. Even more to their disadvantage and to that of their patients, they think symp-

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tomatically rather than systemically, palliatively rather than curatively. In fairness to the shortcomings of specialists, it must be conceded that the inexperienced, routine shot-giving pseudo-syphilologist merits even greater criticism, for he at the other extreme, loses sight of the damage which high-power methods, if misapplied, may inflict upon special and vital structures, and maims or kills his patient in the "cure" of his disease.

Ophthalmologists have labored under extraordinary difficulties in their effort to deal therapeutically with syphilis of the eye in modern terms. Already engrossed by an exacting and difficult specialty, some of them, hearing the clamor around them, have applied such of the new methods as their preoccupations permitted. The result of inadequacy has been, as in general practice—disappointment, flare-back, relapse, quite as often as benefit and permanent cure. There is a two-edged quality to modern syphilotherapeutic methods, which the specialist in other fields, no less than the general practitioner, has had difficulty in understanding. The eye moreover is a structure in the direct line of attack and on the very battle-front of syphilis. It mirrors the nervous system, still the least accessible of all structural groups to the influence of treatment. It is the scene of some of the most critical and fulminating forms of relapse—and since inadequate and misapplied treatment of syphilis has been the rule and not the exception throughout medical practice for more than a decade, it is small wonder that the ophthalmologist has come to under-rate therapeutic progress in his corner of the field of syphilology. Ehrlich, moreover, designated the optic nerve as a possible site of special susceptibility to unfavorable influence by arsenicals, and with so impressive a warning from this august source, it is small wonder that eye men have been conservative in their use of such a drug. I think, too, that ophthalmologists have sustained some disappointment, as have neurologists, in the failure of modern methods to influence markedly lesions such as the Argyll-Robertson pupil and primary optic atrophy; forgetting that seldom elsewhere in medicine, unless it be in cosmetic surgery, do we expect treatment to do away with scars, and nowhere do we expect it to bring the dead to life.

Laboring then under this multiplicity of handicaps, it is no less than inevitable that the specialist in diseases of the eye should have looked askance at modern methods, protested at their obvious bad results, even though often unable to define the reasons, and hung back, a timid and unconvinced onlooker or a half-hearted and ineffective applier of new concepts and methods in syphilotherapy. If the ophthalmologist will realize that he, even more than the medical profession at large, has seen the misapplications and deficiencies, rather than the good effects of modern treatment methods he will judge more leniently and avail himself to his greater satisfaction of what can really be accomplished for the patient with ocular syphilis.

Two Fundamental Principles. Proceeding now to a discussion of fundamentals, the first principle of modern syphilotherapy is this: treatment should not be begun, or at least not treatment with shock-producing drugs such as the arsphenamines, until the entire condition of the patient with reference to syphilis has been fully evaluated by a complete examination. The second principle requires that syphilis of a special structure shall be treated, barring definite contra-indications in the structure itself, as systemic rather than merely local syphilis, for the control of the disease in the patient is ultimately traceable to curative effects throughout the body and the development of an adequate general defense rather than the healing of isolated foci.

Three Characteristics of Arsphenamine Therapy. The necessity for these two categorical injunctions lies not only in the nature of syphilis itself but in certain features of anti-syphilitic drugs, the latter, especially, only recently understood. Modern treatment with the arsphenamines does three things. It produces a flare-up of the process when it is first given which may be damaging or fatal if unrecognized involvement of a vital structure exists; it is responsible for hyper-susceptibility and fulminating relapse if it is stopped too soon; and it produces healing with fibrosis so rapidly that there is little time for functional adaptation in the structures most seriously involved or their collaterals. The Herxheimer flare-up or therapeutic shock occurs in every tissue involved by syphilis and at every stage of the disease. It tends to increase the damage done by the disease, and in vital structures such as the

heart, the brain, and the liver, may be fatal. It is therefore extremely dangerous, especially in late syphilis, to institute arsphenamine treatment for a local lesion without complete examination of the patient to detect all the sites where shock may appear. In the eye, therapeutic shock and serious ill effects are fortunately less frequent, but in a severe neuroretinitis, papillitis or retrobulbar process, may increase visual impairment or result in abrupt extinction of vision. Patients with severe acute inflammatory lesions of the eye, as with all vital structures, should therefore have what we call preparation with slower-acting drugs, and graded arsphenamine dosage, to produce a more gradual subsidence of the acute phase. Similarly, an ophthalmologist or practitioner should not begin treatment for an ocular lesion of syphilis with a shock producing drug, without first taking into account all other parts of the body in which shock may produce untoward results.

Relapse and "Allergy." The eye presents one of the most striking fields available for the demonstration of relapse of a syphilitic infection under inadequate treatment. The mechanism of this relapse as described by Ehrlich, you will recall, consists in the rapid destruction of spirochetes by an arsphenamine, leaving the patient without the physiologic defense normally produced by their presence or by the action of a resistance-stimulating drug such as mercury. If the arsphenamines would destroy all the spirochetes, no relapse need be feared. But if inadequately used, it fails to destroy them just where they are least accessible—in the nervous system and its extensions into the eye and ear. It is at these points, then, that relapse occurs. Because the patient has been rendered hypersensitive or "allergic" perhaps by the wholesale destruction of his invading organisms, as well as defenseless by the great reduction in their numbers, his relapse is the more violent and intractable. This hyperallergy in certain subjects seems to be so extreme as to produce almost the effect of a resistiveness to subsequent arsphenamine therapy. Witnessing as ophthalmologists have, the effect of inadequate use of arsphenamine in the form of explosive optic and retinal neurorecurrence during or after inadequate treatment in early syphilis, it is small wonder that they have had little confidence in a drug producing, as they suppose, such pictures.

They have not realized that what ails the patient is not *arsphenamine*, but not enough arsphenamine.

The Therapeutic Paradox. The therapeutic paradox, damage by fibrosis in too rapid healing, was first observed and correctly interpreted in connection with syphilis of the liver, and later in that of the heart and coronary arteries. There is reason to believe that it occurs in the eye likewise, and that we shall ultimately recognize as associated with hyperfibrosis and uncompensated damage to vascular supply, some of the atrophic changes which seem to be hastened by the injudicious use of arsphenamines in syphilis of the optic nerve and its central stations. If nutritional changes in the heart muscle due to fibrous obliteration of the coronary arteries following œdema or the too rapid healing of gummatous infiltrates in their walls can stop the heart, there is no reason *a priori* why a similar effect in the terminal circulations of the eye should not produce serious damage to vision in the very process of healing. The therapeutic paradox is then to be avoided in the eye as elsewhere in the body, by a prolonged preparation with slow-acting non-fibrosing drugs, and the careful avoidance of too rapid healing. Slow initial action and ultimate great intensity of treatment effect are not incompatible terms, though the methods that produce them are only learned by experience. A skillful sequence in medication can secure a proper crescendo between the pianissimo beginnings that prevent shock and fibrosis and the fortissimo ending that produces lasting results, to the great advantage of the patient.

Specific vs. Non-Specific Effects in Treatment.—We may now add to our syphilotherapeutic ABC a fourth item, D, relating to the specific and non-specific action of treatment. All methods of treating syphilis have two groups of effects—those on syphilis as such, which are specific, and those on inflammatory and granulomatous processes in general, which are non-specific. Applied to the eye, for example, it is known to all of you, no doubt, that a uveitis, not of syphilitic origin but carrying in its background focal infections or tuberculous factors, responds to varying degrees and sometimes quite completely to treatment for syphilis. Tuberculous and mycotic processes throughout the body furnish especially good examples of the fact that treatment for syphilis has healing

effects irrespective of its action on the *Spirocheta pallida*, and that recovery in syphilis takes place in part through stimulation of a general defense mechanism. It would be expected, then, that purely non-specific therapy would have some influence on the course of syphilis—which, as a matter of fact, it does, as evidenced by the response of paresis to malarial fever, and occasionally of resistant interstitial keratitis to intramuscular injections of boiled milk. Non-specific effects set a trap too for the unwary in the form of false therapeutic tests, in which hasty diagnoses of syphilis based on partial resolution of a lesion under arsphenamine or iodides sometimes require re-interpretation because of subsequent relapse, in the absence of other evidence of the disease. Such tests are sometimes very misleading in uveitis and neuroretinitis.

Intensive Treatment without Therapeutic Shock.—As E in our therapeutic alphabet, consider now, for a moment, the production of intense treatment effects without disaster from therapeutic shock—often a critical issue in ocular as well as other aspects of syphilis. Those forms of treatment which attack the *Spirocheta pallida* direct are responsible for therapeutic shock; *i.e.*, the arsphenamines. Treatment which stimulates cellular resistance; *i.e.*, mercury; and treatment directed at lysis of the granuloma; *i.e.*, iodide, does not produce local flare-ups. Bismuth, about which you will at once inquire, lies midway between mercury and arsphenamine as we now understand it. The rate of absorption and the concentration in the blood and tissues, of any one of these drugs, influences both shock and treatment intensity. An arsphenamine, for example, given intravenously, produces therapeutic shock. Given intramuscularly, its action is much slower and shock greatly reduced or absent. A mercurial elevates resistance rapidly if given in rapidly absorbable form; *i.e.*, as an aqueous solution of a simple salt such as the bichloride intramuscularly. It acts very much more slowly and less intensely if given as a complex insoluble in oil suspension such as the salicylate, or even as a simple soluble salt in oil suspension. Treatment intensity is not only dependent on the drugs selected, therefore, but on their combinations, permutations, and modes of administration. Relapse may follow the administration of an arsphenamine even while

the patient is receiving mercury by inunction, to build up his resistance, not because either drug is ineffective, but because arsphenamine is fast-acting and allergy-producing; and mercury by inunction, too slow in developing the patient's protective mechanism. It follows therefore that to get intensity plus lasting effect, the mercurialization must be begun some time before the arsphenamine phase is ended, in order to prepare for the lapse in resistance following the arsphenamine phase. The combination of a specific attack on the *Spirocheta pallida* plus an elevation of the patient's resistance, carried on simultaneously, is obviously more desirable than either effect alone—yet it is seldom utilized to the full even today in dealing with special aspects of syphilis such as present themselves in the eye. In general, it may be said that intensity of attack is favored by the use of combinations of spirillicidal and resistance-building drugs, striking from various angles simultaneously, and that a proper sequence, selection of vehicle, mode of administration, and dosage, can secure effects whose speed and permanency are often a surprise to uninitiated onlookers.

Local vs. General Medication.—A word now about the local *vs.* the general application of medication for syphilis. Local antisyphilitic medication has perhaps more present-day vogue in dealing with eye syphilis than in any other aspect of the disease except neuro-syphilis. The point of view of the local therapist is apt to suffer from the defect common to the specialties in dealing with syphilotherapy, that it neglects the patient while treating the obvious lesion. There is good reason to believe, as I have intimated, that it is the rallying of the entire defense mechanism of the body, rather than the mere destruction of local spirochetes, that makes permanent cure in syphilis. No such general effect can reasonably be expected to follow the injection of minute quantities of an arsenical or mercurial into the spinal canal, the ventricle, the anterior chamber of the eye or the conjunctival sac. Spirochetes grow in a concentration of mercury higher than that in the blood stream at the height of body saturation with the drug. Five hours elapse after the introduction of an arsphenamine into the circulation before spirochetes begin to disappear from a surface lesion—for arsphenamine itself is not

spirillicidal, but only its decomposition products, among them chiefly arsenoxide. The action of a locally applied arsphenamine depends therefore upon fixation and subsequent oxidation of the dye *in situ*, and should be furthered by the longest possible retention of the drug at the site of application. Part of the effect of locally applied arsphenamine and mercury is due to the inflammation and tissue reaction produced, rather than to the drug itself. In general it may be said of all local antisyphilitic treatment from mercurial plasters to intraspinal therapy, that it is being slowly superseded as general treatment becomes more effective, and that its only value at the present time lies in its ability to reach a few spots inaccessible because of deficient blood supply and lack of tropic properties with which to fix the drug brought to them.

Collateral Factors in Treatment.—"G" in this alphabetic résumé of syphilotherapeutic principles concerns collateral factors. The patient with syphilis is often as much affected by non-medicinal as by medicinal influences. Ophthalmologists deserve special credit for their evident appreciation of the relation of strain and trauma and of focal and intercurrent infection, rest, activity, and general hygiene, to the incidence and course of syphilis of the eye. In no aspect of syphilis except tabes are such factors of greater importance than in interstitial keratitis, for example, whose delicate balance between activity and quiescence fluctuates under influences ranging from a chill and cold in the head, to pregnancy. It is part of an intelligent modern therapy for syphilis to clear up or remove every possible disability of this type as a necessary part of the treatment of the disease.

The Arsphenamines in Ophthalmologic Practice.—Ophthalmologists, at least until very recently, have had an unreasonable distrust of the arsphenamines, in general, which, as a syphilologist, I can say in my entire experience, working in coöperation with ophthalmologists has seemed outright contraindicated at the outset in only one condition—primary optic atrophy. Benedict, Ivan Lillie, and I have several times discussed among ourselves the evidences of ocular damage ascribed to the arsphenamines. It is only too easy to forget that syphilis itself takes a huge toll of damage in the eye, and that the fact that such cases are seen after arsphena-

mine has been used, does not justify a *propter hoc* assumption that arsphenamine produced the scars. The ophthalmologist sees eye pathology. He does not see the eyes of hundreds of thousands of patients who, in the treatment of their syphilitic infections, receive annually in the aggregate millions of injections of the arsphenamines, without a significant eye complication. Precise evaluation of such a question cannot be made without controlled studies for which the material does not, at present, exist. Examinations of vision, fundus and perimetric fields, on all patients in an extended series before and after the proper use of the arsphenamines, is the first prerequisite. Until such material has been gathered we shall, of course, be dependent on impressions—and mine, as I say, based on the effect of 100,000 injections of arsphenamines observed in the last twelve years, is in support of the comparative innocuousness of these drugs as such, and, *intelligently used*, in syphilis of the eye.

Of the arsphenamines, the original "606," is, while the most difficult to use, unquestionably the most effective. In the treatment of ocular syphilis where a minute and difficultly accessible lesion may be responsible for serious damage in a short time, and relapse is always on the horizon, it seems quite inexcusable to employ the therapeutically inferior and less dependable neoarsphenamine.

Under-dosage (0.3–0.45 grams) with an ineffective arsphenamine (neoarsphenamine) at irregular and over-long intervals (10 days to 2 weeks) and for an insufficient series of injections, given by a reaction-producing technic, forms the explanation of many disappointments, failures and relapses. I have seen six injections of neoarsphenamine thus employed produce less than no effect on interstitial keratitis—in fact, the process progressed until checked and reversed by the first two injections of arsphenamine. Yielding to the logic of the situation rather than actual observation of unfavorable effects, I advocate the preparation with iodide and mercury or bismuth, discussed below, in dealing with lesions involving the second nerve and the retina, including choke disc and the extra-ocular innervation. In the last-mentioned cases especially, the possible background of an acute involvement of the nervous system makes the use of an arsphenamine at the out-

set full of dangerous possibilities. In other lesions, the risk from arsphenamine, I am satisfied, is nil; the time and therapeutic effectiveness gained, invaluable. The best general rule summarizing American arsphenamine practice prescribes that the initial dose should not exceed one-half the normal weight dosage, and subsequent treatment should follow the rule of one dg. per 25 lbs. body weight if spirillicidal effect is wanted, or two-thirds that dose if maximum non-specific or tonic action is desired. If neoarsphenamine is used it has seemed to me almost better to use the 0.4–0.6gm. dosage for tonic effect than the Ehrlich maximums. No interval greater than a week between injections, no course less than 6 nor more than 12 injections, should be in general employed.

The Effective Use of Mercury.—Mercury, to produce its best effects in ocular syphilis, should be used either in daily intramuscular injections of a soluble salt, or as inunctions. Mercury by mouth has no longer any place in the treatment of active syphilis of the eye. A soluble salt like the succinimide or bichloride has a rapidity of action superior to anything except arsphenamine, and it acts from the resistance-building side, so that it does not produce Herxheimer reactions. I know of nothing that can surpass it in getting the upper hand of a rapidly advancing process on which one cannot use arsphenamine at the outset. The combination of arsphenamine intravenously and a soluble mercurial intramuscularly outranks in speed and effectiveness any other form of general treatment for syphilis, and can perform veritable miracles, judged by the standards of earlier days. The inunction, while ultimately effective, is too slow in getting into action to be used in a race against ocular damage.

The Status of Bismuth.—Bismuth is a better spirillicide than mercury, but definitely inferior to arsphenamine. Its resistance-building qualities are not directly measurable as yet. There is reason to believe that it may be spirochetostatic, rather than spirocheticidal, holding the infection in check rather than curing it. Used as an insoluble preparation, as it now is, it has the weaknesses of insolubles. Its low toxicity, the fact that it forms a new angle of attack on the infection, that it is more effective than insoluble mercurials and does not, in spite of its spirillicidal action produce an

appreciable Herxheimer effect, all justify it as an advance in syphilotherapy. It will certainly not be the miracle-worker that it was at first believed to be. Already it is apparent that it does not prevent relapse in early syphilis, and that it does not protect the child in utero as well as arsphenamine and mercury. It is, in fact, a combination of low toxicity with somewhat more than average mercurial effectiveness. I doubt if it ever entirely supersedes mercury unless better soluble preparations are devised. I rate it inferior in intensity to a soluble mercurial and even at times, in ultimate efficiency, to a good inunction Kur. There is no evidence as yet that it will contribute any radical advance in the treatment of ocular syphilis except as an excellent opening in acute processes that are not advancing too rapidly. Under no circumstances is it to be thought of as a substitute for arsphenamine where arsphenamine can be used.

The Use of Iodide.—The iodides are familiar to all of you. I only propose for your consideration two details. Experimental work by Pearce, of the Rockefeller Institute tends to show that to secure the tonic effects of iodide administration in elevating general resistance to syphilis, small doses are preferable to large ones. But clinical and biochemical investigation shows that to produce a penetration of the drug into difficultly accessible parts of the body such as the nervous system, a high bloodstream concentration must be obtained by the use of large doses by mouth and intravenously. For the past ten years I have seldom prescribed less than 15 grains of potassium iodide t.i.d., have usually prescribed 50, not infrequently 100, and at times as high as 250 and even 500 grains t.i.d. The intravenous administration of sodium iodide in my 8 years' experience with it, has proved a valuable aid in dealing with syphilis of the nervous system, and *ipso facto* with such aspects of ocular syphilis as are phases of neurosyphilis. The method is not to be commended for such conditions as interstitial keratitis or iritis, for oral administration meets all indications in such cases. In fact, there is no object in administering iodide intravenously in less than 10 gram doses daily, for a sufficient concentration can be maintained by 100 grains t.i.d. by mouth. Ophthalmologists, as I know them, can well afford to learn the advantages of larger

iodide dosage—20 to 50 grains t.i.d. instead of the 2 to 5 grain doses so often used.

Special Problems—Treatment of Syphilis as a Whole.—As the closing section of this presentation, I should like to comment in rapid-fire fashion on the treatment of some special aspects of ocular syphilis. First let me re-emphasize the principle that syphilis of a special structure like the eye should be treated in accordance with principles applicable to the stage and type of syphilis in which the special manifestation appears. Never treat eye syphilis as an isolated manifestation. An iritis in a patient with secondary or recurrent early syphilis must be treated locally by the ophthalmologist, of course—but systemically as early syphilis, with attention concentrated, not merely on the prompt response of eye symptoms, but on the serologic, neurologic and cardio-vascular controls and the massive treatment effects necessary to cure or arrest the disease. Similarly in nerve lesions of the eye, the treatment should be that of neurosyphilis, and will require an intensity with which few ophthalmologists of my acquaintance would have either time, inclination, or equipment, to deal. The routine series of neoarsphenamine injections too often given by a specialist merely to treat a special symptom seldom accomplishes lasting good in such cases, except as tonic treatment in old tabetics. I have elsewhere described a unit course which makes an excellent opening in the treatment of nerve lesions involving the eye, with the exception of primary optic atrophy.[1]

Actively Inflammatory Lesions; Simple Optic Atrophy.—Mention of this exception brings up special methods for dealing with special lesions, and questions of prognosis. It is a general rule in syphilotherapy that response is proportional to the preponderance of active inflammatory process over scar. Applying this to the eye it will be apparent that acute inflammatory lesions of nerve, retina and choroid, as well as iris and cornea, make the best response. Inasmuch as it is often difficult to judge the ratio of activity to scar, one not infrequently sees surprising degrees of recovery in nerve lesions such as secondary optic atrophy, in which little was expected at first sight. But in the simple primary optic atrophies, in

[1] Stokes, John H., *Modern Clinical Syphilology*, 1926, p. 959, W. B. Saunders Co., Phila.

which the central damage is too often presumably advanced or complete before the nerve changes and failure of vision becomes marked, the outlook is nil for complete recovery, poor for improvement, and but fair for arrest. My opposition to arsphenamine at the outset in these cases is not shared by such observers as Moore.[1] I have not on the other hand seen intraspinal therapy, extolled by this author, produce results notably superior to those obtained by the intensive use of mercury and intravenous iodide. Gifford insists that intraventricular use of a mercurialized serum is superior to all other modes of treatment. The recent case series, Gifford 7, Hume 3, Viner and McMurtry 2, are obviously too small for conclusions, though they include what would ordinarily pass as hopeless cases. I have seen at least two disasters from intraventricular therapy, with resulting total blindness. Thus far, I have seen no evidence that fever therapy has improved the outlook of this distressing form of neurosyphilis.

Treatment of Interstitial Keratitis.—Interstitial keratitis constitutes a special problem in syphilotherapy in which I believe ophthalmologists must bear the brunt of a charge of backwardness in their failure to avail themselves more generally of the intensive modern methods. The general opposition to arsphenamine and the half-hearted use of all forms of treatment for syphilis are nowhere more apparent than in this particular field, and nowhere with less justification. I do not believe I exaggerate when I say that few eye men have ever seen what really intensive treatment can do for interstitial keratitis. Fortunately, the recently published reports of Carville and Derby, and of Guy, dealing with large series of cases in which modern methods were applied by a syphilologic clinic, are furnishing the needed demonstration. We hope soon to witness the passing of the old slogan "interstitial keratitis always involves the other eye"—to see the percentage of relapse reduced from 23 to 2 or 3, and to see the course of the vast majority of cases reduced from months to weeks, with a permanently damaged residuum of almost zero instead of 40 to 60 per cent. Such results are not too much to

[1] A résumé of current literature bearing on the treatment of syphilis of the eye by Dr. Stanley O. Chambers will appear in a forthcoming article in this journal.

expect when ophthalmologists are finally willing to discard their prejudices and avail themselves in behalf of their patients, of the heavy artillery and organization of modern syphilotherapy. That such a change in viewpoint is taking place is indicated by the increasing endorsement of arsphenamine in recent ophthalmologic literature. Heredosyphilis must be treated with somewhat the intensity of early syphilis, and treated, so far as the eye is concerned, to an ophthalmologic standstill. The infiltration of the cornea once begun cannot be immediately blocked, but it can be reduced in extent and severity to a surprising degree by the simultaneous use of arsphenamine intravenously, mercury succinimide intramuscularly and liberal doses of potassium iodid by mouth, followed up by bismuth and arsphenamine, with inunctions and iodid between courses. By such methods the process can, I believe, if seen early, be limited to one eye in all but a few cases, and relapse forestalled. The complete resolution of infiltrates under such measures has seemed to surprise some of my ophthalmological friends. Attention to the details of hygiene, skillful local management, subsequent improvement of vision by refraction and so forth, on which ophthalmologists have always wisely insisted, is of course imperative.

Tryparsamide.—No discussion of syphilotherapy and the eye is complete without mention of tryparsamide. This drug has no virtues in ophthalmic syphilis. It is interesting that while it may injure the optic nerve, it has no effect at all on a vascular process such as a chorioditis. Tryparsamide is much more likely to injure the optic nerve of the abnormal eye than the normal one, however, according to Cady and Alvis. The danger of ocular damage from tryparsamide is proving to be less than was expected, in experienced hands. With a patient not too befuddled to cooperate in describing his prodromal symptoms, and weekly examinations of visual acuity and perimetric fields (not fundus alone) during the first course, trouble can be forestalled, and if it appears, the drug may be stopped and then safely resumed after a month's rest. The apparent improvements in vision which occur under tryparsamide are, I believe, more often improvements in intelligence and cooperation than actual enlargements of form or color fields.

I trust that the frankness with which I have discussed the viewpoint of the syphilologist in dealing with ocular syphilis, at points where it contrasts with what seems to be prevailing ophthalmologic practice, has not impressed you as merely bumptious and calculated to arouse antagonism and ill-will. I must apologize too for the incompleteness of my presentation of many points, enforced by space and time limitations. I heartily welcome the criticisms which your special knowledge of the eye as an organ will bring forward. If from our exchange of ideas, some elements of the always priceless, because intelligent reconciliation of general and special viewpoints can arise to the advantage of the victims of ocular syphilis, I shall feel at once richly rewarded and generously forgiven.

VISUAL FIELD STUDIES IN A CASE OF OPTIC NEURITIS SECONDARY TO SINUS DISEASE.[1]

By Drs. J. MILTON GRISCOM and MARGARET M. MONROE.

(With three illustrations in the text.)

THE investigations of Onodi, and more recently the important researches of Shaeffer have greatly increased our knowledge of the anatomic relationship existing between the optic nerve and the posterior nasal accessory sinuses. It has been shown by many dissections that there is no typical or constant arrangement of these cells, and that the optic nerve may pass directly through enlarged posterior ethmoids, and in most instances is separated from them and the sphenoids only by a thin partition of bone. It is not surprising therefore, in view of the frequency of sinusitis, that the optic nerve should be affected in some way, and the many cases reported during the past fifteen years give evidence of the increased recognition this subject has received. Perhaps even more important have been the perimetric studies of Van der Hoeve, Birch-Hirschfeld, Markbreiter, Walker, Bordley, Macwhinnie and others who have recorded their observations. In disturbances of the visual pathway enlargement of the blind spot, a central scotoma or a cæco-central scotoma are the most constant findings. It is the visual fields and their clinical significance that prompts the report of the following case.

On November 27, 1923, Mrs. G. U., age 23, applied at the Wills Hospital for the relief of temporal headaches from which she had suffered for two months, and blurred vision in her left eye, which was first noticed four days pre-

[1] An abstract of this paper was read before the Eye, Ear, Nose and Throat Section of the San Francisco County Medical Society on August 23, 1926.

viously. Vision in her right eye on admission was $\frac{1}{10}$ and in her left eye $\frac{1}{10}$. Externally both eyes were normal. Ophthalmoscopic examination showed the right eye to be highly myopic, but otherwise the fundus was normal. In her left eye, the media were clear, the nerve head swollen two diopters, margins much blurred, and the retina adjacent to the lower margin of the disc œdematous for 1D.D. The vessels were overfull, but the macular region and periphery of the fundus appeared normal. Pressure over the ethmoid region on the left side elicited some tenderness, and because

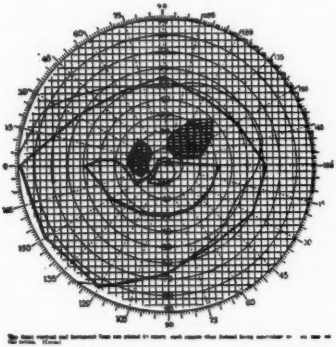

CHART 1. Fields at first visit. Form, red and green. 1 degree test object. Vision—$\frac{1}{10}$.

of this and the left sided optic neuritis, she was sent at once for a nasal examination. This was made in the clinic of Dr. Ross H. Skillern at the Medico-Chirurgical Hospital by Dr. Geo. L. Whelan, to whom thanks is due for the report on the sinuses and their subsequent treatment. He reported that X-ray examination showed frontal sinuses clear, ethmoids on both sides occluded with exudate, sphenoids clear, and the right maxillary sinus opaque. On November 28th, 1923, the day following her admission to the hospital, the fields were taken in the left eye (Dr. Monroe) on the Ferree-Rand perimeter. The blind spot was markedly enlarged and there was a large absolute scotoma in the upper nasal quadrant. The form field was full except for a notch up and in, the blue markedly cut, the red almost hemianopic and the green field contracted practically within the 100 circle. An operation was advised and on November 29th the middle turbinate was removed and the anterior ethmoid cells opened under cocaine-adrenalin anæsthesia. The

fields taken the following day reflected the post-operative reaction. The enlarged blind spot and paracentral scotoma were merged, and the notch in the form field deepened. The color fields were unchanged.

On December 3, 1923, the scotoma was somewhat smaller, the form field was full and those for red and green enlarged. Again on December 15th the perimeter recorded an improvement. The scotoma tended to separate into the two com-

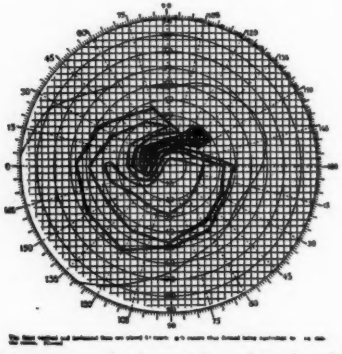

CHART 2. Field three weeks later when sinus involvement was most marked. Form, red and green. 1 degree test object. Vision— $\frac{4}{5}$ Partly.

ponent parts seen before operation. Form was full and color fields were enlarged, especially that for green. The ophthalmoscope showed some decrease in the neuritis at the upper border of the disc but the swelling in the lower half and the œdema of the adjacent retina were unchanged. Vision $\frac{4}{5}$.

At this time the patient was confined to her home for about a week with an attack of the grippe and returned for examination on December 21st. The scotoma had greatly enlarged, the form field had contracted, while blue and red were unchanged. Three days later on December 24th, the fields confirmed the suspicion that there was an exacerbation of the sinus condition. The notch in the form field had deepened, almost meeting the increased enlargement of the scotoma. Operation was again urged and on December 28th, Dr. Whelan exenterated the posterior ethmoid cells and punched out the anterior sphenoid walls, revealing a purulent ethmoiditis.

Fields taken on December 29th, the day following oper-

ation, showed the post-operative flare by an enlargement of the scotoma, which had broken through the form field with an entire loss of vision in the upper inner quadrant. Color fields were not taken because the patient was too fatigued. Following this second operation, there was a rather rapid improvement and on January 2, 1924, the form field had regained its normal position, the scotoma had decreased and color fields showed a corresponding widening. Two weeks later the absolute scotoma had become much smaller

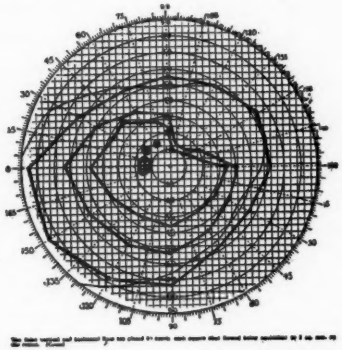

CHART 3. Field six months later. Sinuses free from inflammation. Form, red and green. 1 degree test object. Vision— $\frac{20}{20}$.

and a small relative scotoma appeared on one side, and for the first time the blue field was continuous about it. Red and green likewise improved and extended on the temporal side up to the vertical meridian. On February 5th, the blind spot was only slightly enlarged with a small relative scotoma above it, and the color fields were continuous, although they still showed a cut in the upper nasal quadrant.

At this time a third operation was suggested and on March 12, 1924, a curtain-like covering of mucous membrane over the anterior sphenoidal wall was removed. There was the usual post-operative flare as shown by some cutting in the blue field, but recovery was rapid. The hoped-for full restoration of the color fields did not, however, materialize and on July 1, 1924, there remained two small absolute scotomata and the color fields were still contracted up and in. At this time the upper margin of the disc was well defined, while at the lower margin there was some blurring and adjacent to this at the site of the retinal œdema noted at the first examination there was a small area of choroidal atrophy. Vision $\frac{20}{20}$.

In the above detailed case the optic nerve undoubtedly was in very intimate contact with purulent matter, in the underlying posterior ethmoid or sphenoid cells. The field studies made it possible to state with reasonable accuracy that the nerve did not lie in a mass of inflammatory material, but was affected in only the lower portion. The absence of a central scotoma not only influenced the prognosis, but indicated also that the nerve disturbance was due to pressure by or contact with the inflamed sinuses, and a toxic affection of the nerve with involvement of the papillo-macular fibers was absent. Moreover, and of greater importance than any other feature, the presence of the scotoma with the enlargement of the blind spot, and the alteration in the form and color fields gave an unfailing indication of the regression or exacerbation of the sinusitis when central vision remained virtually normal and the ophthalmoscopic picture unchanged. When in this case after a simple operation drainage was established, the fields recorded a definite improvement. A month later the sinus inflammation became worse or the drainage was blocked, and this was promptly shown by the decreased fields and enlarged scotoma when visual, ophthalmoscopic and rhinologic examination showed no change. A more radical operation on the sinuses was performed and again the field studies recorded the improvement.

In optic nerve affections due to sinus inflammations, visual field studies may be the best and perhaps only guide to the progress of the disease. By such field studies the ophthalmologist and rhinologist may be able to avoid a radical operation on one hand, and too long delayed operation on the other.

THE ORGANOLUETIN REACTION IN THE DIAGNOSIS OF INTERSTITIAL KERATITIS.

By Dr. DOHRMANN K. PISCHEL.

From the Department of Ophthalmology, University of California Medical School, and the First University Eye Clinic, Vienna, Professor Meller.

THE problem of finding a skin reaction for syphilis similar to the tuberculin reaction in tuberculosis has interested a large number of investigators for many years. Variously obtained extracts of syphilitic organs of the different stages of syphilis, chemicals, even tuberculin itself, have been used by Neisser-Meirowsky, Loeper, Desbois and Duroeus, Favre, Fontana, Bruck, Ciuffo, Bertin and LeBruyant, and many others in the last two decades. The results of the investigations were on the whole unsatisfactory. Tedeschi (1) working with an aqueous extract of fresh initial syphilomata, which he sterilized at 60°C., and then passed through a Berkfeld filter, reported positive skin and conjunctival reactions. He used no normal human controls, however, and as yet his work has not been substantiated.

In 1911 Noguchi (2), who in the meantime had succeeded in producing pure cultures of spirocheta pallida, reported the results of a skin reaction obtained by injecting, intracutaneously, a suspension of these cultures which he called luetin. A brief summary of his results shows that in the early (primary) stages of acquired syphilis, the reactions were practically always negative. The later (secondary) stage gave a percentage of positive reactions, while the late (tertiary) stage gave a large percentage of positive reactions. Positive reactions were also the rule in hereditary syphilis. On the other hand, parasyphilitic cases usually gave negative results.

Many workers have confirmed the results of Noguchi, among others, Nobl and Fluss, Kaemmerer, Robinson Fox, and Bellatini. Baerman and Heineman (3), in working among the Javanese with luetin supplied by Noguchi, reported a much larger percentage of positives in the early primary and secondary stages than those found by Noguchi himself. They stated that their differences might very possibly be due to the fact that the syphilis among the Javanese is a rather abortive and milder type, tending to produce localized processes rapidly. Their deduction that it is negative in hereditary syphilis is not well founded, as they only had one case from which to judge. Ward (4), working with luetin prepared in a manner almost identical to Noguchi's, also obtained a higher per cent. of positive reactions in the primary and secondary stages than the latter author. The only ones to question the results of Noguchi are Jeanselme and Burnier (5).

In 1913 Fischer and Klausner (6) reported the results of a cutaneous reaction with an aqueous extract (which they called pallidin), prepared from the lungs of cases of pneumonia alba, which, as is well known, are rich in spirochetes. Injections were made intracutaneously using about $\frac{1}{60}$–$\frac{1}{25}$ *cc* of the solution. The reaction started in 24 hours and reached its acme in 48 hours. They reported that they obtained positive results in cases of gummatous lues and hereditary lues, but otherwise negative results in early (primary and secondary) syphilis. Later Klausner (7) published further results in this work over a large series of cases, the results of which caused him to conclude that this skin reaction was specific for the tertiary and hereditary forms of lues. This was thus different from Noguchi's work. He further observed that under the influence of treatment the reaction gradually disappeared.

To determine if possible to what agent the reaction was due, especially as some workers had obtained skin reactions in syphilitic cases with normal liver extracts, Klausner prepared a control extract of the lung of a syphilitic fœtus which was proved to contain no spirochetes. With this he obtained only negative skin reactions. He therefore deduced that the results were due to the spirocheta pallida present in the pneumonia alba lungs.

These results, as a whole, have been substantiated in work

published by Mueller and Stein (8), who worked with similarly prepared extracts of syphilitic liver, spleen and lymph glands, which they called "organoluetin." These reports together cover well over two thousand cases.

Summarizing the results of these investigations, it appears that late (tertiary) syphilis gives a strong positive skin reaction for organoluetin. Early acquired syphilis (primary and secondary) gives practically always negative results. Finally, hereditary syphilis frequently gives positive reactions.

Two interesting side notes may be made at this point: One is that Mueller and Stein (9) first reported that a Wassermann reaction which had been negative previous to the making of an organoluetin test would be found to be positive a short time afterwards. While this change did not always occur after one skin reaction, repeated skin inoculations would often bring about this interesting phenomenon. In the present series of cases this change to a positive reaction was noted, twice from a negative Wassermann and twice from a trace positive one. Secondly, it has been noted before by several authors that the luetin reaction, as well as the organoluetin reaction, may be negative at the first test, but if repeated it becomes positive. By some this has been considered due to a sensitization process, but no definite explanation has been offered. This phenomenon was observed three times in this series of cases, the reaction becoming positive on the second test.

In the field of ophthalmology not much work has been reported on the subject of luetin reactions until lately. Cohen (10), Loewenstein (11), Browning (12), reported observations with Noguchi's luetin with results that partly substantiated the Wassermann reaction and partly supplemented it.

In 1914, A. Klausner (13), again working with the aqueous extract of syphilitic organs, reported results in 100 cases of eye diseases which were suspected of being of syphilitic origin. He obtained 20 positive reactions; of these 12 were cases of interstitial keratitis, 4 of iridocyclitis and 1 each of the following: cyclitis, retinitis, retinochorioiditis, and papillitis. Eight cases of interstitial keratitis gave negative reactions. He concluded that this reaction was valuable in ophthalmology for several reasons. It supplemented the Wassermann reaction

in cases of interstitial keratitis. Its presence indicated hereditary syphilis or the gummatous stage, and, vice versa, its absence precluded the diagnosis of gumma or hereditary lues.

In 1921 Lauterstein and Planner (14) published the results of the organoluetin reaction, with the extract made as previously described in the work of Mueller and Stein (8). They reported that the organoluetin reaction in ophthalmology is practically specific for interstitial keratitis (keratitis parenchymatosa). In 112 cases of various eye diseases there were 38 positive luetin reactions. Of these 36 were cases of interstitial keratitis. The other two were iridocyclitis luetica. Three cases of interstitial keratitis gave weakly positive reactions and six gave a negative result. Two luetic iridocyclitis cases gave a weakly positive reaction also. Conversely twenty-three cases of keratitis profunda non luetica gave negative reactions. Their results follow in tabulated form. (Table 1).

TABLE I

Disease	*No. of cases*	*Organoluetin reaction.*			*Wassermann reaction*	
		Post.	*Weak*	*Negative*	*Post.*	*Negative*
Keratitis parench. (recent)	33	30	1	2	23	10
Kerat, Parench, (old)	12	6	2	4	3	9
Kerat, profunda non luetica	23	—	—	23	—	23
Iridocyclitis luetica	16	2	3	11	15	1
Other diseases, Atrophia, nerv. opt. chorioiditis, kerat. pistil.	28	—	—	28	25	3
Total.....	112	38	6	68	66	46

These workers felt that the reaction was practically specific for interstitial keratitis. In summing up the results of their work the authors stated "that a positive organoluetin reaction was found in all luetic diseases, especially in fresh cases of interstitial keratitis and often in healed cases. In these cases,

the organoluetin reaction was more delicate than the Wassermann. Due to its frequent occurrence in fresh interstitial keratitis and its constant absence in other types of deep keratitis, it had a valuable differential diagnostic significance. Furthermore, it might be a means of determining if an iridocyclitis were of primary or hereditary origin.

Very recently Rabitsch (15) published the results of the organoluetin reaction in 143 cases of eye disease. In all of his seven cases of interstitial keratitis, he obtained positive organoluetin reactions. He also reported positive organoluetin reactions in four cases of deep keratitis or iridocyclitis. It is known that positive reactions do occur in iridocyclitis and, furthermore, as he did not classify these cases any more accurately it is impossible to comment on his results, which are the only ones giving such findings to be found in the literature.

In summarizing the results of all the work done on the organoluetin reaction in ophthalmology, it may be stated that the positive reaction is specific for interstitial keratitis (restricting this term to the keratitis of hereditary lues) with very occasional positive reactions from iridocyclitis lues hereditaria, but not in the deep keratitides other than the interstitial form.

These results seemed so valuable that it was decided to gather further statistics on the result of the organoluetin reaction in cases of interstitial keratitis. The organoluetin was prepared in a manner similar to that used by Klausner and Fischer. The luetic organs (lungs of pneumonia alba, syphilitic lymph glands, liver and spleen) were cut into fine pieces and then rubbed up in a porcelain mortar with four times the weight of sterile 0.9% naCl solution which contained enough carbolic acid to make it ¼% strong. The solution was allowed to stand for some time, during which the larger particles settled out, leaving above a turbid yellowish-red fluid. This was drawn off and kept on ice. The extract was always tested out on cases which were known to react positively. A good extract would keep many weeks.

The test was made in the following manner: Between 0.1 and 0.2 cc. of the extract is carefully injected intracutaneously on the volar surface of the forearm. A definite bleb of about

5*mm* or slightly larger diameter should result. The reaction is read after 24–36 hours. A positive reaction is one in which a sharply defined red plaque forms around the site of the injection. This plaque is definitely indurated and slightly raised. It is usually of oval form, about 2 × 4*cm* large, but may reach a much larger size. The sharp definition and urticarial swelling of the erythema are very important. Sometimes long lymphangitic streaks running up the arm, even up to the axilla, occur. Pseudoreactions are easily detected. They are characterized by not having the definite border or the induration and by their rapid disappearance (within 48 hours). The true reaction shows some induration and a livid color for several days.

Here it might be well to mention the local reactions which sometimes occur. These were noted by Mueller and Planner (16) to be both subjective and objective. Subjective was the appearance of pain in the involved part. Objective was increased secretion in the affected area, rapid healing of old processes and, curiously, the appearance of new gummata in the vicinity! Ophthalmological symptoms were noted only once, and this was the appearance of an hypopyon in a case of interstitial keratitis within twenty-four hours after the injection of the organoluetin.

This present group of statistics starts from the time when Lauterstein and Planner finished their work, and thus represents an independent continuation of their observations. The report is based on 131 cases diagnosed as interstitial keratitis (keratitis parenchymatosa) on the basis of hereditary lues which were admitted to the wards of the First Eye Clinic of Professor Meller, in the Allgemeines Krankenhaus in Vienna from January 1, 1921, to December 31, 1925, a period of five years. Of these there were 125 patients on whom a Wassermann reaction of the blood was made, and 80 of these were tested with an organoluetin reaction. The cases were not selected for the organoluetin reaction, but this was made as routinely as the exigencies of the work in the wards permitted. The results of the reactions of the eighty cases in which both a Wassermann reaction and an organoluetin reaction were obtained are those to be discussed in this paper. The statistics are detailed in Table II, which is self-explanatory.

TABLE II

Reaction	*Positive*	*Negative*	*Total*	*%Negative*
Organoluetin	70	10	80	12.5%
Wassermann	66	14	80	17.5%

The percentage of negative reactions is slightly smaller for the organoluetin reactions than for the Wassermanns, apparently indicating that the former test is more delicate. For all practical purposes, however, the difference is too slight to enable one to advocate either in preference to the other on the grounds of accuracy.

The relation of the two reactions is given in Table III, and these are discussed in the following paragraphs. A reaction indicated by ± is a weakly positive one. The two reactions have similar results in 77½% of the cases, and identical results in 71¼%.

TABLE III

Group	*Organoluetin reaction*	*Wassermann reaction*	*Number of cases*	*%*
1	+	+	54	67½
2	+	±	4	5
3	+	−	8	10
4	±	−	3	3¾
5	±	+	1	1¼
6	−	+	6	7½
7	−	−	3	3¾
8	−	±	1	1¼

GROUP 1. The 54 cases in which both reactions are positive need no special comment.

GROUP 2. Of these four cases with the trace positive Wassermann shown in the table above, all were typical fresh cases involving the first eye. There is no explanation of the weak blood reaction.

GROUP 3. Of the eight cases with negative blood reactions but positive skin tests, six were typical fresh cases with only the first eye involved or both simultaneously involved, the disease being as yet only of short duration. These show that the Wassermann reaction is negative in a high percentage of fresh cases of the remaining two, one (Case I) was a case in

which the second eye was involved (a recurrence), the first one having passed through the disease three years before. The second case (Case II) was a very typical case of lues hereditaria with temporal bossæ, periostitis of the tibiæ, chronic otitis media, and vertical oval corneæ. The patient had had an attack of interstitial keratitis ten years before in the R.E., and now the L.E. was also involved. This case will be mentioned later.

GROUP 4. Of the three cases with the weakly positive skin reaction and the negative Wassermann reaction, the first was a woman (Case III), age 22, whose first eye had been involved two years before, and since then she had received much neosalvarsan. The second (Case IV), a girl of 20, was a fresh case, but she had been treated with neosalvarsan two years before because of her hereditary syphilis. The last of these three (Case V) was a three-year-old girl in whose eye the condition had dragged on for over a year before she was brought to the clinic.

There were thus twelve cases with a positive organoluetin, in which the Wassermann was a trace positive four times and negative eight times. Therefore in twelve cases, or 15%, the organoluetin reaction was a positive help in making a diagnosis. To these should be added the three cases with weakly positive skin reactions and negative blood test, giving fifteen cases or 18½% in which the organoluetin reaction was of aid. These results alone would make the organoluetin reaction a valuable diagnostic aid if it were specific for interstitial keratitis. Its specificity, which has already been mentioned, will be discussed again later.

In all these cases the negative Wassermann can easily be explained and this will be done below in the paragraphs headed DISCUSSION OF NEGATIVE REACTIONS. The same will be done in regard to the weakly positive organoluetins.

GROUP 5. The one case with a weakly positive skin reaction and positive blood was a 28-year-old man (Case VI) admitted to the hospital on account of traumatism. He had had an attack of interstitial keratitis fourteen years before. This weak skin reaction will be discussed later.

GROUP 6. In six cases the organoluetin reaction was negative and the Wassermann positive.

Two of these cases of negative organoluetin and positive blood occurred on the same day and may have been due to a poor organoluetin. This cannot be definitely checked up, so it must remain a surmise. The remaining four were typical cases, one being of the variety keratitis centralis annularis Vossius. These six cases will be mentioned again later.

GROUPS 7 and 8. The most interesting cases are those three in which both the organoluetin and Wassermann reactions were negative. To these should also be added the one case of negative organoluetin and a trace positive Wassermann. The first of these (Case VII) was an orphan girl, age 12. Family history was not obtainable. This was not an absolutely typical case. The R.E. was diagnosed interstitial keratitis and the L.E. eczematous keratitis. Repeated Wassermann and organoluetin reactions were negative. A review of the status of the case, as preserved in the records, did not positively confirm the diagnosis. The value of this case is much in doubt, but it is included in the statistics.

The second case of negative organoluetin and Wassermann reactions had a negative spinal fluid as well. This patient (Case VIII), a girl aged 14, had had an attack of interstitial keratitis one and a half years before in the R.E. Her family history brought out that her mother had aborted twice and had had two still births. On admission the L.E. had been inflamed for eight days. The case ran a typical course.

The third case was a young woman (Case IX), age 21, with a negative family history. Organoluetin and Wassermann were negative on entrance. Her first attack of interstitial keratitis had been four years before, located in the R.E. within a year, the L.E. had also become involved. The present illness was of four days duration, relapsing in the L.E. She had received strenuous antiluetic treatment (Salvarsan and Mercury) in the interval. In spite of the negative Wassermann she was given another course of neosalvarsan, during which another Wassermann was taken and this time it was a trace positive.

The one case of a negative organoluetin and trace positive Wassermann was a woman (Case X), age 38; family history was uncertain. Five years before she had had an attack of interstitial keratitis in the L.E., at which time she had received antiluetic treatment. The inflammation ran a typical course.

DISCUSSION OF NEGATIVE REACTIONS.

A. The Negative Wassermann Reaction.

These last three cases mentioned above are similar, in that the patients had already passed through an attack of interstitial keratitis in one or both eyes. In this group (*i.e.*, cases in which at least one eye had previously been involved) also belong Cases I and II, which had positive organoluetin reactions and negative Wassermann, and Case III with weak skin reaction and negative blood. Case IV, with similar reactions, had received Neosalvarsan for hereditary syphilis before her first eye was attacked, and at that time she had a negative Wassermann though a positive organoluetin reaction. Also with similar reactions was Case V, in which the disease had lasted

TABLE IV.

Case No.	*Description*	Reaction	
		Organoluetin	*Wassermann*
I	Recurrence in second eye 3 years after first.	+	−
II	Recurrence and relapse after 10 years; had received much neosalvarsan.	+	−
III	Recurrence in second eye after 2 years; had received neosalvarsan.	±	−
IV	Fresh case in first eye; had received neosalvarsan 2 years before on account of hereditary lues.	±	−
V	First eye involved; process had dragged on over a year.	±	−
VIII	Recurrence in second eye after 1½ years.	−	−
IX	Relapse after 3 years; had received much salvarsan and mercury.	−	−
X	Recurrence after 4 years; had received much salvarsan and mercury.	−	±

over a year. These cases are summarized in Table IV for clarity. Since the diagnosis of Case VII is in doubt (with negative reactions, and one eye diagnosed interstitial keratitis and the other phlyctenular keratitis) it is omitted from these discussions.

From this table it can readily be seen that all eight cases were "old," in that they had been treated with neosalvarsan, mercury, etc., or, as in one case, the disease was a year old.

All these, seven negative and one weakly positive, Wassermann reactions can probably be explained. Igersheimer (17) has pointed out, in his *Syphilis und Auge*, that the Wassermann reaction of patients who have recovered from an attack of interstitial keratitis may become negative after a variable period of time. This may be the result of energetic treatment with salvarsan, mercury, etc., or it may happen without any treatment at all, due to the "spontaneous healing" of the disease. The latter is of course rarer than the former. After treatment the reaction sometimes becomes negative with surprising rapidity. It is a well known fact that a negative Wassermann also often results in cases of acquired syphilis after treatment with salvarsan, mercury, etc. Patients with negative reactions over a long period of time may have a recurrence of their former disease. In such cases the Wassermann usually becomes positive during the new attack, but this is not always the case. This is also true of relapses as illustrated by two of the cases cited above (Cases II and IX) in which the Wassermann was negative even at the start of the new attack. Igersheimer noted in three of his own cases relapses with negative blood reactions. This, I believe, shows why the negative Wassermann reactions were found in some of these cases. Seven unexplainable negative Wassermanns are left to show that even in fresh cases the Wassermann reaction may be negative. It now remains to account for the negative organoluetin reactions.

B. The Negative Organoluetin Reactions.

The six fresh cases (Group 6) with negative organoluetin and positive blood reactions have already been mentioned; and must be left with the statement that apparently the organoluetin reaction, no more than the Wassermann, is positive in 100% of the cases.

One case (Case VI) had a weakly positive skin reaction and positive blood test. There were four cases (Groups 7 and 8) in which the organoluetin was negative three times and a trace positive once, and three cases in which the organoluetin was weakly positive with a negative blood reaction, making a total of eight negatives or weakly positive organoluetins. Of these eight, one case (Case VII) with both reactions negative, must be left with a question as to the cause as well as to the correctness of the diagnosis. Of the remaining seven, five (Cases III, VI, VIII, IX, X) had had a previous attack of interstitial keratitis in one or both eyes, from one and a half to fourteen years before; one (Case IV) had received much neosalvarsan before her eye was attacked, and one (Case V) was a case lasting over a year. These are summarized in Table V with Case VII omitted again.

TABLE V

Case No.	*Description*	Reaction	
		Organoluetin	*Wassermann*
III	Recurrence in 2nd eye after 2 years; had received neosalvarsan.	±	−
IV	Fresh case in first eye; had received neosalvarsan 2 years before on account of hereditary lues.	±	−
V	First eye involved; process had dragged on over a year.	±	−
VI	Healed case; admitted for traumatism.	±	−
VIII	Recurrence in second eye after 1½ years.	−	−
IX	Relapse after 3 years; had received much salvarsan and mercury.	−	−
X	Recurrence after 4 years; had received much salvarsan and mercury.	−	±

In studying these seven negative or weak reactions, all in recurrent, old, or relapsing cases, a question naturally arises. This is whether the organoluetin, like the Wassermann, due to treatment or to time, becomes negative after a lapse of years.

Klausner (7) in his report on the organoluetin reaction in general syphilis stated it tended to become negative after treatment. Baerman and Heineman (3) also mentioned this fact. For interstitial keratitis this seems to be true in a certain percentage of old healed cases without any relapses. Lauterstein and Planner reported twelve old healed cases in which series they found six positive, two weakly positive, and four negative organoluetin reactions. To this I can add two more cases, one after two years gave a positive reaction and the other after fourteen years gave a weakly positive one. In view of all these results it seems logical to conclude; *that the organoluetin reaction tends to disappear under treatment.* This would explain these seven negative or weakly positive organoluetin reactions.

Does the organoluetin reaction stay negative at the time of a relapse or recurrence?

It has been stated by Igersheimer that the Wassermann frequently is negative at the beginning of such an attack, though at some time later in the attack it may have become positive again.

Is this rule also valid for the organoluetin reaction in recurrent and relapsing cases? The number of cases in the present report is not large enough to allow one to draw any certain conclusions; but of the six old cases three had negative reactions, one a weakly positive reaction and two a positive reaction—this last in the ten-year-old relapsing case! These results are tabulated below in Table VI.

TABLE VI

Number of years since previous attack	*Organoluetin*	*Wassermann*
1½	−	−
2	±	−
2	+	−
3	−	−then +
4	−	±
10	+	−then +

While interesting, no statement can be made until a large series has been worked out; but at least it is safe to say that

the organoluetin reaction, like the Wassermann, often is negative during a recurrence or relapse.

The specificity of the reaction has already been mentioned, especially the results of Lauterstein and Planner. To these results I can add 29 cases of various diseases, in which the organoluetin reaction was made and in all of which it was reported negative. These cases were not selected but taken at random for the test. Attention is especially directed to the various cases of keratitis. (Table VII).

TABLE VII

Disease	*Number*	ORGANOLUETIN REACTION		WASSERMANN RREACTION	
		Negative	*Positive*	*Negative*	*Positive*
Keratitis profunda	5	5	0	0	5
Keratitis punctata profunda	3	3	0	2	1
Keratitis punctata superficialis	2	2	0	1	1
Keratitis disciformis	2	2	0	0	2
Retino-chorioiditis	6	6	0	1	5
Atrophia nervi optici	4	4	0	3	1
Iritis pap. luetica	1	1	0	1	0
Iridocyclitis	3	3	0	0	3
Conjunctivitis Exematosa	3	3	0	1	2

SUMMARY.

In summing up the results of all the work done on the organoluetin reaction in ophthalmology it seems evident that here is a diagnostic agent specific for interstitial keratitis. Its accuracy is as great as the Wassermann on which so much reliance has been placed in the past. Furthermore, it seems even more delicate than the Wassermann reaction. However, in the case of adults it must be remembered that another disease (*e.g.* a gumma) may be present, and thus cause a positive reaction when the keratitis has an origin other than lues hereditaria.

The practical use of the organoluetin reaction in this country is at present hampered by the fact that the extract is not obtainable commercially. When once a large laboratory

makes a reliable extract available its advantages will be appreciated. To be able to make one's own injection and to read the result oneself is one advantage. The simplicity and lack of pain in making an intracutaneous injection is another great advantage. The disagreeableness of trying to obtain blood from a small child, coupled with a frequent natural repugnance of the laity to have a small child hurt is still another feature in favor of the intracutaneous method of diagnosis. And further the significance of the Wassermann reaction is well understood by most patients who feel insulted if such a test is suggested, whereas a mere skin test brings up no ill feeling toward the physician. Its aid in making a differential diagnosis in the various types of deep keratitis should make it a very acceptable diagnostic aid to the ophthalmologist.

CONCLUSIONS.

I. The organoluetin reaction is a positive aid in the diagnosis of interstitial keratitis.

II. In these cases it has proved to be at least as delicate as the Wassermann reaction.

III. Since the organoluetin reaction is regularly negative in cases of deep keratitis other than the interstitial variety, it is a valuable means of making a differential diagnosis.

IV. The organoluetin reaction tends to disappear under antiluetic treatment.

V. It appears that the organoluetin reaction is often negative in recurrent or relapsing cases.

In closing I wish to thank Dr. A. Fuchs for his help in making the material for this paper available.

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ABSCESSES OF THE OPTIC NERVE.

By Dr. ALGERNON B. REESE, New York.

(With three illustrations on Text-Plate X.)

ABSCESSES of the optic nerve occur seldom enough to warrant the presentation of two different types which have been encountered in the collection of pathology slides belonging to Professor Ernst Fuchs.

From the microscopic examination of four hundred and forty cases of ectogenous endophthalmitis from all possible causes forty-one cases were found which had advanced to a panophthalmitis, and from these forty-one cases one case showed multiple abscesses of the optic nerve. The diagnosis of panophthalmitis was made in those cases of endophthalmitis in which the inflammatory reaction could be seen extending from the interior of the eye outwards through the emissaria, in those cases which showed collateral inflammation of the peri-bulbar tissues, and in those cases which showed pus in the choroid. The relatively few cases of panophthalmitis are explainable through the fact that one always endeavors to enucleate in a case of endophthalmitis before panophthalmitis ensues, and in those cases which had advanced to the clinical picture of panophthalmitis operations other than enucleations were performed (in Professor Fuchs' clinic). An abscess is interpreted as being a focal accumulation of pus cells in the area of which the structure of the tissue harboring the abscess has disappeared through dissolution. The case of multiple abscesses of the optic nerve caused by panophthalmitis is as follows:

History.—A boy, age six years, received a perforating injury of the globe by a piece of cartridge eight days ago.

The cartridge entered the globe at the nasal margin of the cornea. Because of ensuing panophthalmitis the globe was enucleated.

Microscopic examination shows, except for the optic nerve, the usual findings in panophthalmitis, *i.e.*, the vitreous contains pus which is more marked around the papilla (Fig. 1—A and B) and the base; the iris, ciliary body and retina show an infiltration with pus cells and the choroid is infiltrated with pus cells and lymphocytes (Fig. 1—F). The foreign body struck the retina in the midline in the inferior half of the globe and at this point has caused a hemorrhage and distortion of the nuclear layers. The optic nerve shows an œdema of the papilla and a marked infiltration of polynuclear leucocytes which is more marked in the innermost layers and decreases gradually posteriorly to within a few millimeters posterior to the lamina cribrosa where it ceases (Fig. 1). This polynuclear infiltration is more marked around the central vessels, especially the vein which is thrombosed with fibrin (Fig. 1—C and G). From the disc the polynuclear cells are pouring into the vitreous and have accumulated under the interior limiting layer of the retina around the disc margin (Fig. 1—A). To the nasal side of the disc and anterior to the lamina cribrosa is an abscess measuring one by two millimeters (Fig. 1—D). There is another abscess posterior to the lamina cribrosa on the temporal side measuring one by three millimeters (Fig. 1—G). Each of these abscesses appears to be in relation to a small vessel which is an anastomotic branch between the central vessels and the ciliary vessels. No organisms were present in the abscesses. The meninges and intervaginal space are normal. (Fig. 1—J and H).

In this case of perforation of the globe organisms were introduced in the vitreous body and these gave rise to an infection. Pus cells poured into the vitreous mainly from two sources—the base of the vitreous and the papilla, these being the two places where the internal limiting layer of the retina is missing and therefore allows a free migration of the cells to the site of positive chemotaxis in the vitreous. Schwalbe, Stilling and Lebourg have shown the existence of lymph channels from the interior of the eye through the optic nerve around the central vessels, and Behr through his experiments on choked discs also assumes an outflow of lymph from the eye through the central supporting tissue strand of the optic nerve. Therefore as the abscesses in the nerve con-

FIG. 1.

A—Pus cells caught under the internal limiting layer of the retina as they poured out of the disc.
B—Pus cells pouring into the vitreous from the disc.
C—Central artery and vein. The latter is thrombosed with fibrin.
D—Abscess around a branch of the central artery.
E—Retina.
F—Choroid containing lymphocytes and pus cells.
G—Abscess extending from a collateral vessel to the central vein which is thrombosed with fibrin.
H—Dura.
J—Arachnoid and pia.

FIG. 2.

A—Intervaginal space containing pus cells.
B—Abscess.
C—Dura.
D—Arterial circle of Zinn surrounded with pus cells.
E—Detached retina.
F—Area of necrosis and hemorrhage.
G—Necrotic border tissue.
H—Choroid which is partly necrotic and contains pus cells and hemorrhage.

FIG. 3.

A—Abscess.
B—Intervaginal space with endothelial proliferation.
C—Dura.
D—Arterial circle of Zinn.
E—Abscess of retina.
F—The retinal abscess E lay further temporally than depicted in the drawing so F represents the break in continuity of the retina.
G—Retina nasally.

ILLUSTRATING DR. ALGERNON B. REESE'S ARTICLE "ABSCESSES OF THE OPTIC NERVE."

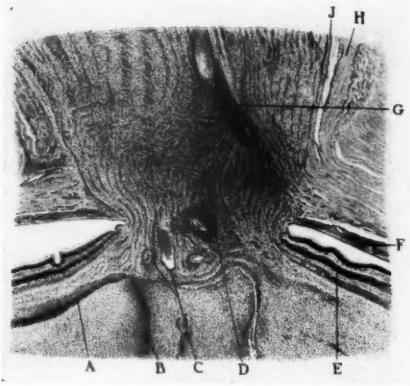

FIG. 1.

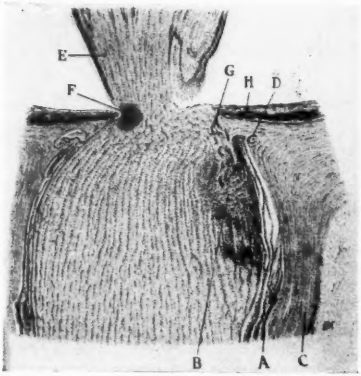

FIG. 2.

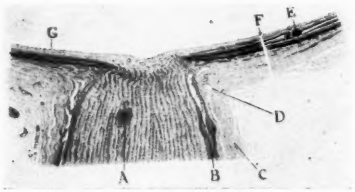

FIG. 3.

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tained no organisms and were in relation to small collateral vessels it is supposed that they were formed by the toxins from the vitreous infection which spread out from the globe through the peri-vascular lymph channels of the nerve. As one abscess was on the nasal side in the papilla (Fig. 1—D) and the other on the temporal side in the optic nerve stem behind the lamina cribrosa (Fig. 1—G) it is evident that the latter was not due to a direct extension of the toxins through the nerve from the former. The abscess in the papilla was prevented from extending posteriorly by the lamina cribrosa which acted as a barrier to the toxins. The abscess in the optic nerve stem behind the lamina cribrosa was due to the spread of toxins through the peri-vascular lymph spaces to this site along the collateral vessel.

In endophthalmitis and panophthalmitis when the toxins are not sufficient to call forth an optic nerve abscess there is a reaction in the nerve in the form of peri-vascular infiltration of lymphocytes and plasma cells which are also present to a less degree in the septa. The glial tissue shows proliferation especially in the lamina choroidalis and in the optic nerve septa posterior to the lamina cribrosa and even in the nerve bundles themselves, but to a less degree. This can occur in the acute cases of only a week or so duration. The meninges of the optic nerve often show a distinct proliferation of the endothelium on the outer side of the arachnoid, and to a less extent of that on the inner side. The subarachnoid space may contain lymphocytes and sometimes even pus cells. As the severity of the endophthalmitis and panophthalmitis increases this whole picture changes by a replacement of the lymphocytes and plasma cells with polynuclear cells which in the most severe cases progress to the formation of abscesses as happened in the case here cited.

When an enucleation is performed for beginning panophthalmitis in which there is an abscess of the optic nerve it would be immaterial whether the nerve is severed proximally or distally to the abscess which is a toxic one and would heal as soon as the source of the toxins—the eye ball—is removed.

The orbital abscesses which sometime appear secondary to a panophthalmitis do not reach the orbit by way of the optic nerve. They perhaps do not reach the orbit even by way of

the emissaria but gain their access to the orbit probably through rupture of the globe from a necrosis of the sclera. On the other hand the collateral inflammation of the peribulbar tissue in beginning panophthalmitis which gives rise to exophthalmos, limitation of motion of the eyeball, etc., is perhaps due to the spread of toxins through the emissaria.

A melano-sarcoma of the choroid often becomes necrotic and thereby so toxic that a severe inflammation of the entire eye ensues. In such cases the toxins may produce an abscess of the optic nerve. The following is such a case:

History.—A man 71 years old had noticed a gradual but progressive deterioration of vision in his right eye for the past 15 months. For the past nine days the eye had been severely inflamed with high tension.

Microscopic examination shows that the anterior portion of the choroid contains a highly pigmented and necrotic melano-sarcoma. The iris is completely necrotic and the choroid, ciliary body and retina partly so. There is a polynuclear infiltration of the choroid. In the optic nerve s an abscess 3 millimeters long and 1 millimeter wide, located on the temporal side just posterior to the lamina cribrosa (Fig. 11—B). Through the necrotic border tissue (Fig. 11—G) the abscess is in direct continuity with the choroid which is partly necrotic, and contains a hemorrhage (Fig. 11—H). The pia adjoining the optic nerve abscess has been dissolved and the pus is extending into the subarachnoid space (Fig. 11—A). The abscess in the nerve extends further posteriorly than the purulent exudate in the intervaginal space. The arterial circle of Zinn in the abscess region shows a perivascular exudate of polynuclear cells (Fig. 11—D). On the opposite side of the nerve, the nasal side, adjoining the termination of the choroid, is a round well localized area of necrosis with hemorrhage (Fig. 11—F).

In this case the necrotic melano-sarcoma of the choroid acted as a toxic agent to the entire eye. The toxins spread through the choroid causing necrosis and reached the optic nerve through the necrotic border tissue. On the temporal side of the nerve an abscess was formed and on the nasal side an area of necrosis with hemorrhage. The abscess in the nerve also spread through the pia into the intervaginal space. Michel claims a connection between the subchoroidal space and the intervaginal space which would make one think of the

possibility of this abscess having been formed by the spread of toxins from the subchoroidal space to the intervaginal space and there causing an abscess which extended into the optic nerve. But this is not the case because the abscess in the nerve is more extensive than the purulent infiltration of the intervaginal space, and also because the path of the abscess can be traced from the choroid through the necrotic border tissue into the nerve.

From the examination of thirty-seven cases of endogenous or metastatic endophthalmitis only one showed an abscess of the optic nerve. The report of this case is as follows:

History.—A girl, age not noted, was suffering from a general septicemia of unknown origin. The fundus showed septic retinitis (white plaques in the retina surrounded by a red rim (Roth)) two days before death.

Microscopic Examination.—(Only Posterior segment of the eye sectioned).

Retina.—On the temporal side 1 disc diameter lateral to the macula region is an abscess one-half millimeter in diameter (Fig. 111E). The abscess originates in the internal nuclear layer and is sharply localized here and to a less extent to the external plexiform and external nuclear layers. The abscess is composed purely of polynuclear leucocytes with red blood cells around the periphery. The remainder of the retina is surprisingly normal in appearance.

Optic Nerve.—One millimeter posterior to the lamina cribrosa and on the nasal side is a sharply localized abscess one-half millimeter in diameter (Fig. 111 A). The abscess is composed of polynuclear leucocytes with some red blood cells. In the neighborhood of the abscess there is a mild infiltration of the nerve tissue with polynuclear leucocytes.

Arachnoid.—Shows some endothelial proliferation (Fig. 111 B).

Vitreous.—Contains a few polymorphonuclear leucocytes.

Choroid.—Normal.

This is clearly a case of an abscess of the optic nerve and retina due to the embolic implantation of germs at these sites. In the retina the abscess originates from the internal nuclear layer where the retinal arterial system terminates. In the optic nerve it originates probably from one of the small arterial branches anastomosing the central arterial system with the ciliary system. The optic nerve abscess did not give rise to sufficient neuritis for even a suspicion of an abscess to be

present clinically. In fact, the reaction of the entire eye is conspicuously absent which is probably explained by the debilitated condition of the patient and the short duration of the disease. The embolic abscesses of the retina were seen ophthalmoscopically as the typical white areas surrounded by a red margin (Roth), the white being represented by the polynuclear leucocytes and the red margin by the red blood cells.

In view of the fact that metastatic endophthalmitis begins in the retina in over ninety per cent of the cases it is rather surprising to find the optic nerve, which belongs to the same vascular system as the retina, so well spared. The explanation for this apparent immunity of the optic nerve to metastatic abscesses is perhaps that the bacterial emboli, which are composed of agglutinated organisms with perhaps some fibrin, are larger than the blood elements and are carried along in the fastest portion of the blood stream which is the central portion, and therefore have no opportunity to enter the small branches of the central artery which go off at right angles into the optic nerve septa. Metastatic endophthalmitis is not an uncommon condition so it is very fortunate its predelection is for the retina rather than the optic nerve where abscesses have a tendency to give rise to a suppurative basal meningitis as indicated by the two cases reported in the literature—the one by Bakker and the other by Jaensch.

Conclusions.—Abscesses of the Optic Nerve may be of two Types.

I. *Toxic*—

a. From infections of the vitreous toxins may gain access to the optic nerve through the peri-vascular lymph spaces and cause an abscess.

b. From necrotic sarcomas of the choroid toxins may spread through the border tissue of the optic nerve and cause an abscess.

II. *Embolic*—

A septic embolism may cause an abscess of the optic nerve. The relative immunity of the optic nerve to embolic infections in contrast to the retina is due to its vascular arrangement.

NOTE—Due acknowledgment is accorded Professor Ernst Fuchs for his kindly interest and suggestions.

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THE USE OF THE OBLIQUE MUSCLES OF THE EYE.

By Dr. GEORGE LINDSAY JOHNSON, F.R.C.S., Durban, South Africa.

EVERY surgeon knows that the external muscles of the eye are supplied by three nerves; the upper, lower and internal recti, together with the inferior oblique, by the 3rd nerve, the external rectus by the 6th, and the superior oblique by the 4th nerve. The 3rd nerve is by far the most important, for it supplies eight muscles, viz.: the four muscles mentioned above, the levator palpebræ, and three muscles inside the eye, viz., the ciliary muscle, its companion or circular muscle discovered by Johannes Müller, and the circular or constrictor muscle of the Iris. Although every one of our readers is perfectly aware of what I have just written, I deem it necessary to mention these facts, because I hope to show in this article that some novel and interesting observations are dependent on them. Now it is a well observed fact that every nerve which has more than one branch, on being stimulated, sends a current along the other branches as well, or at least tends to do so. Or, to put this in a concrete form, if we send a current along the superior rectus branch, and allow it to flow along the internal rectus branch as well, they will act far more harmoniously together, than if each of these muscles were governed by separate nerves derived from separate nuclei.

Now why is it necessary to have any oblique muscles at all? Why will not the four recti muscles supply all the necessary movements of the globe? Or to put it in another way, why are there only two oblique muscles, the one serving to pull the globe upwards and outwards, and the other downwards and outwards? If they are so necessary, why does not Nature supply

a pair to turn the eye upwards and inwards, and downwards and inwards? I admit that it is quite possible for the globe to be turned obliquely in any direction by employing two pairs of recti to work together such as the internal rectus with the superior or the inferior recti, or the external rectus with the same muscles. And if they worked harmoniously I see no reason why they should not do their work perfectly. But unfortunately the two latter pairs will not work in harmony together as is the case with the former, and that is why Nature has to manufacture the two obliques to do the work of turning the eye downwards and outwards, or upwards and outwards. There is no need for a pair of obliques to turn the eye upwards and inwards, or downwards and inwards at all, because the same nerve supplies both those pairs of muscles, and the same stimulus will travel along both branches harmoniously, so that the movement will be accomplished smoothly and regularly. But the case is very different with regard to the other side of the eye, for the external rectus is governed by the 6th nerve, which arises from a different nucleus from that of the 3rd nerve, and consequently when one wants to look downwards and outwards, or upwards and outwards, the impulse would have to travel along two different nerves, and it would be very difficult to effect an oblique movement harmoniously. Nature therefore has to provide a pair of oblique muscles for the movements on the outer side of the eye, but it is obvious that they would be quite superfluous on the inner side. But the reader might ask, "Do we not use two different nerves when we look sideways in either direction? True, but you must not forget that the eyes are then rotated along a horizontal plane, and no delicate adjustment is required between the pair, as is the case when we turn the eye obliquely in any direction, for in the former case the eye is guided along a straight path by the superior and inferior recti, which effectually prevent any wobbling as the eyes sweep along the horizon, and moreover if one lags a bit behind the other it does not matter in the least, although it would be fatal in the former case.

There is still another point of interest in connection with this subject. I have stated that the 3rd nerve governs the muscles of accommodation, of convergence, and also of the

contraction of the iris. Now it should be the aim of every refractionist to see that these three motions act ***equally*** and ***harmoniously***. This is commonly overlooked when testing for glasses, and its neglect is the chief reason why so many oculists fail in curing the headaches and eyestrain so commonly met with in practice. Very few oculists observe the motility of the iris, and yet it is of the highest importance, for the activity of the ciliary muscle and that of the iris go together, so much so that one may form a fairly accurate guess of the accommodative power of the ciliary by observing the extent of movement of the iris. I have never seen these points mentioned in any book on either Physiology or Ophthalmology, and that is my only reason for writing this article. If they have appeared before I can only plead ignorance of the fact.

A CASE OF ADENO-CARCINOMA OF THE UPPER LID, SUBSEQUENTLY EXTENDING INTO THE ORBIT.

By Dr. HERBERT WRIGHT WOOTTON.

Surgeon, Manhattan Eye, Ear and Throat Hospital, New York City

(*With one illustration on Text-Plate XI.*)

THE patient, a male, 48 years of age, presented himself at the Manhattan Eye, Ear, and Throat Hospital, January 18, 1926, with a tumor involving the entire left upper lid. The family history was negative. The growth was of two months duration, and the patient stated that it had commenced at the nasal side, with little or no pain. The tumor involved the entire lid symmetrically, surface smooth, skin freely movable and slightly reddened, no pain and no tenderness. At the first examination, the tumor seemed to have extended a little above the lid margin to the nasal side. It seemed to form a part of the cartilage and was very hard. Sinuses clear and the X-ray revealed no erosion of bone in the orbit. Wassermann (blood) negative, vision $\frac{20}{200}$. There was no proptosis at this time, and the cornea, where it could be seen, was normal. There was a moderate amount of chemosis of the ocular conjunctiva. An examination of the fundus could not be made. Right fundus normal. Treated by mercurial inunctions and K.I. The tumor increased in size, was removed February 26th, through a horizontal incision in the skin. The wound healed without complications. The removal of the tumor was incomplete, for the lid margin, which was obviously involved, was left behind, and the operation was performed primarily with the object of obtaining a microscopic specimen. The tumor was of cartilaginous consistency, and the microscopic examination showed that it was an adeno-carcinoma containing a large amount of fibrous tissue. The remaining tissue was treated by radium by Dr. G. A.

Robinson. There were four treatments with 50 milligram tubes, March 9, 17 and 24, and the last June 4. The growth finally invaded the orbit producing marked proptosis. The vision became reduced to hand movements, and an examination of the fundus revealed a neuro-retinitis with hemorrhages. Exenteration of the orbit was performed June 18. The tumor had extended behind the globe. There has been no local recurrence up to the present date, and a general examination, October 8, was negative.

The report of Dr. A. A. Eggston, pathologist of the hospital, is as follows:

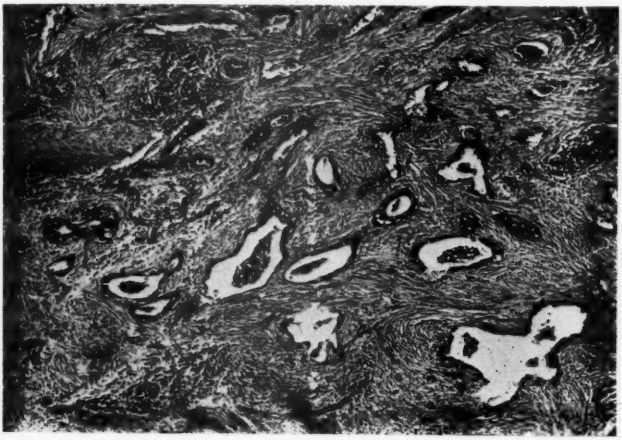
The specimen consists of an irregular firm mass of tissue measuring $3.5 \times 2.5 \times 2cm$. Upon gross section it cuts with considerable resistance and the cut surface shows fine trabeculæ with some small yellowish areas.

Microscopic sections show numerous irregular gland structures and epithelial cell areas surrounded by a rather dense fibrous stroma. The glands in some areas are dilated and in others filled with proliferated epithelial cells. The cells are rather large and some show irregular nuclei and atypical mitotic figures. Some of the epithelial cells have infiltrated the stroma to form irregular masses without basement membrane and without histological structure. Some of the gland acini are quite normal in structure and appear in areas to be sweat glands, while others are apparently a modified type of Meibomian glands. The stroma in areas is quite cellular, in others, it is more dense and hyalinized. There are distinct areas of mononuclear cellular infiltration, chiefly lymphocytic. The inflammatory reaction is more marked around the glandular structures. In some areas the connective tissue is œdematous and shows myxomatous degeneration.

Diagnosis.—Fibro-adeno-carcinoma.

Remarks.—This tumor is pathologically a border case. However, considering the cellular proliferation and infiltration and the clinical history, it is my judgment that this is a relatively slow-growing malignant tumor.

ILLUSTRATING DR. HERBERT WRIGHT WOOTTON'S ARTICLE "A CASE OF ADENO-CARCINOMA OF THE UPPER LID, SUBSEQUENTLY EXTENDING INTO THE ORBIT."



Section of Tumor—High Power.

TREATMENT OF IRIDOCYCLITIS BY SUBCONJUNCTIVAL INJECTIONS OF ATROPIN AND EPINEPHRIN.

By Dr. FRANK H. RODIN, San Francisco, Calif.

(From the Department of Ophthalmology, Stanford University Medical School.)

IN my first communication (1) I described a simple technic for subconjunctival injection of atropin and epinephrin in iridocyclitis, and reported thirteen cases. The amounts used were from 2 to 5 minims of atropin 4 per cent. and from 2 to 6 minims of epinephrin, 1:1000. In three of the cases, subconjunctival injections of atropin alone, had only a slight effect on the dilatation of the pupils. A maximum dilatation of the pupils was obtained: by further injection of atropin and epinephrin combined in two cases, and in the third by a subconjunctival injection of epinephrin alone. Three cases showed symptoms of atropin poisoning and I suggested the use of a smaller quantity of atropin and an increase in the amount of epinephrin.

This is a report of sixteen cases of iridocyclitis treated at Stanford University Eye Clinic in which instillations of atropin failed to bring about the maximum dilatation of the pupils. The injection in the majority of cases, consisted of 2 minims of atropin 2 per cent. and 4 minims of epinephrin, 1:1000. Butyn in 2 per cent. solution was used to anesthetize the eye, except in two cases, where cocain 4 per cent. was instilled.

There was only one patient that showed definite signs of atropin poisoning: however, this patient also showed an idiosyncrasy to the drug, as on two occasions after instillations

of atropin the eyelids became intensely red and swollen, and the use of the drug made her feel "dopey." One male patient, aged 81 years, felt sick when he reached home following an injection, but after two hours rest in bed, was well again. This is as against three cases of definite atropin poisoning in the first series of thirteen patients reported, in which the larger dose of atropin was used. Patients will often complain of palpitation of the heart soon after an injection. This usually lasts about twenty minutes and is due to the epinephrin. Of course one must be on the lookout for atropin poisoning. However, this does not require any special treatment, as a short rest in bed usually clears up the symptoms.

The smaller dose of 2 minims of atropin 2 per cent. and 4 minims of epinephrin, I found to be a safe dose for subconjunctival injections and has all the efficacy of the one used in the first series. In one case, ephedrin (2) was substituted for epinephrin, but without apparent result. Four hours after the first injection, instillations of atropin 4 per cent. brought about a further dilatation and later a subconjunctival injection of atrophin and epinephrin dilated the pupil to the maximum. The use of ephedrin in only one subconjunctival injection without any apparent beneficial result, does not prove that it is not as efficient as epinephrin in this work.

Although the combined injection has no effect in very old adhesions, it should be tried in those of recent origin. One case was of two months duration and another, of four months.

In my first communication, where cocain was used as an anesthetic, the mechanism of the drugs injected was discussed. It is well known that cocain acts as a local anesthetic and stimulates the sympathetic. Mills (3) experimenting with subcutaneous injections of cocain in rabbits found that the pupil will return to normal in one and a half hours after cocain injections, but where epinephrin, 1:1000, was instilled in an eye, the pupil remained dilated as long as thirteen hours. Epinephrin instilled alone in a normal rabbit's eye produced no dilatation, even though the instillations were repeated every few minutes for hours. However, dilatation did occur under such treatment following cocain injections which in themselves were much below the strength necessary for dilatation.

Fröhlich and Loewi, (4) found that cocain sensitizes the pupil, blood vessel and bladder to stimulation by epinephrin, and Gold (5) suggested that cocain does not stimulate the sympathetic endings of the iris, but renders them more excitable to stimulation. Joël and Fränkel (6) state that in dogs' and cats' eyes the inhibition in the dilating apparatus can be increased through the application of cocain, so that otherwise ineffective intravenous doses of adrenalin, now become effective. Cocain, according to them, acts here as an anesthetic and not as a stimulant.

In order to eliminate the effect of cocain, butyn in 2 per cent. solution was substituted as an anesthetic, and the same results were obtained. Apparently the cocain is not essential in bringing about the dilatation of the pupils when using atropin and epinephrin subconjunctivally. As far as it is known instillations of butyn in the eye have no effect on the pupil, and do not act in the same manner as cocain. Tainter (7) found that butyn failed to cause sensitization to epinephrin on blood pressure in animals. The mechanism of action of the atropin and epinephrin as used in subconjunctival injections remains to be solved.

Since the publication of the first paper my attention was drawn to the report of the eye section of the San Francisco County Medical Society before which Pischel (8) gave an extract of Hamberger's paper on "Experimental Glaucoma Therapy." After a subconjunctival injection of epinephrin, extreme dilatations of the pupil were obtained; synechiæ which withstood action of atropin were sometimes torn. This induced Pischel to add to the atropin-cocain subconjunctival injections in the cases of stubborn iritis an equal amount of epinephrin, with good results.

CONCLUSIONS.

1. In twelve cases of acute iridocyclitis in which instillations of atropin (4 per cent.) failed to dilate the pupils to the maximum, a combined subconjunctival injection of atropin and epinephrin dilated the pupils.

2. The combined injection appears to have little or no effect on old adhesions. A good dilatation was obtained in two cases. There was no separation in two other cases.

3. A subconjunctival injection of atropin and epinephrin should be used where instillations of mydriatics fail to dilate the pupil. This should be repeated if necessary.

4. Old age is not a contraindication to the injection. One patient was aged 81 years.

5. Where for any cause a rapid or instantaneous dilatation of the pupil is called for, a subconjunctival injection of 2 minims of atropin 2 per cent. and 4 minims of epinephrin, 1:1000, is indicated.

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FATTY INFILTRATION OF THE ANTERIOR SEGMENT (XANTHOMATOSIS BULBI).

By Dr. SANFORD R. GIFFORD, Omaha, Nebr.

From the Department of Ophthalmology, University of Nebraska Medical College.

(With two illustrations on Text-Plate XII.)

SINCE this condition, first investigated by von Szily in 1923 (1), does not seem to have been described in the American Literature, the occasion of seeing and examining histologically a typical case would seem to warrant a brief report.

Clinically the essential feature of the condition is the occurrence, usually in blind or degenerated eyes, of a gradually increasing yellowish discoloration of the anterior segment. The condition of hyalin or amyloid degeneration in corneas with old scars was well known, and before von Szily reported his histological findings, probably a number of cases like his had been considered due to a similar degeneration of the cornea itself. Amyloid degeneration was the diagnosis in his first case, revised only after the findings in his second case. This was a woman of sixty-six whose left eye had been blind from glaucoma for ten years and had shown for several years an orange ring behind or in the cornea. The slit-lamp showed some yellowish spots in the iris, where this was visible. The eye was embedded in gelatin and stained for fat. The cause of the yellowish discoloration was then seen to be a mass of fat globules and cholesterin crystals in the anterior chamber. The cornea itself showed only a few fine fat globules near the limbus, but the fat in the chamber was pressed so close as to

appear to be in the cornea. The iris was densely infiltrated, the fat globules being in and between the cells. In another case the yellow appearance had developed during the two years following a cataract operation, with secondary glaucoma. A similar fatty infiltration was seen in sections, and in addition the vitreous was found to be full of fat and the sclera to show several necrotic areas occupied by cholesterin crystals and fat.

Meesman (2) saw a similar condition in an eye blind for years following operation for traumatic cataract. The lower half of the anterior chamber was seen to contain a yellowish mass, with some crystals floating above it. A scleral puncture showed cholesterin crystals in the puncture fluid. Sections showed a similar picture to that in von Szily's cases. In addition there were several necrotic cavities in the cornea filled with cholesterin and fat. In this area, Descemet's membrane was defective, and he concluded that a fluid rich in cholesterin had penetrated the cornea at these places, cholesterin later precipitating and causing necrosis. A very similar picture was produced in rabbits by injecting cholesterin-rich solutions into the anterior chamber. A case reported this year by Jaensch (3) is very similar. Secondary glaucoma occurred after operation for traumatic cataract in a girl of seven, the eye showing the characteristic discoloration eight years later. In this case, scleral puncture revealed cholesterin in the sub-retinal fluid and the blood showed an increased cholesterin content (.18%). By the differential staining reactions obtained, Jaensch concludes that a mixture of lipoids, glycerides, neutral fats, fatty acids and cholesterin was present.

My patient, Olaf N., a man of forty-two, had undergone a steel injury to the right eye two years before with magnet extraction performed in another clinic. A severe reaction followed this and the vision was gradually lost. He does not know exactly how long the yellowish color of the eye has been present but has noticed no change for several months. He came in on account of an attack of pain and inflammation which had begun four weeks before. Vision was zero. The eye presented the appearance shown in Fig. 1, being moderately congested, with a yellowish material filling over half of the

ILLUSTRATING DR. SANFORD R. GIFFORD'S ARTICLE, "FATTY INFILTRATION OF THE ANTERIOR SEGMENT (XANTHOMATOSIS BULBI.")

FIG. 1.

(Dark areas appeared distinctly yellow.)

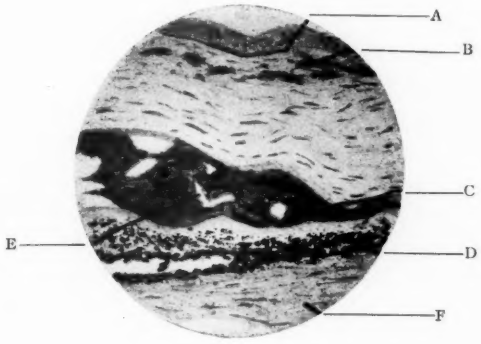

FIG. 2.

A. Fat impregnation of Bowman's membrane.
B. New blood vessels under Bowman's membrane.
C. Droplets of fat in anterior chamber.
D. Fine droplets of fat in iris.
E. Spaces indicating presence of cholesterin crystals.
F. Membrane of new connective tissue behind iris.
(A, C, & D stained red with Scharlach-R.)

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anterior chamber and moving about when pressure was made on the cornea. In the upper half of the cornea was a yellowish nodule which does not move and was apparently in the deeper corneal layers. The corneal epithelium is smooth. Tension was sub-normal. On account of severe pain, persisting in spite of atropine and sodium salicylate, the eye was enucleated. On account of the resemblance of the eye to von Szily's pictures, a condition of fatty infiltration was recognized, so the usual celloidin imbedding during which all fat is dissolved from the tissues, was avoided, and a modification of the method described by Graff (4) was employed. Since some such method is essential for the study of fat deposits in the eye, I include a brief description of the method.

1. Fix eye in 10% formalin.
2. Wash in water 24 hours.
3. Embed in gelatin. Enough gelatin is dissolved in 1% phenol solution to make a fluid of the consistency of thin celloidin (about 12% gelatin). The whole eye is left in a deep dish loosely covered filled with this gelatin solution. After about thirty-six hours enough water has evaporated so that a thick solid block is formed.
4. Cut block out of dish and leave in 25% formalin (10% formaldehyde) two days to harden.
5. Cut block with a sharp razor into pieces 3–5*mm* thick.
6. Freeze and cut sections of these thin pieces in the usual way.
7. Stain sections in Scharlach-R (saturated solution in 70% alcohol and pure acetone—equal parts) 2 to 5 minutes.
8. Counterstain with alum-hematoxylin. Mount in glycerin-jelly (Mallory and Wright).

Sections treated in this way showed a picture much like that described by von Szily but in a stage evidently not so far advanced (see Fig. 2). The anterior chamber is very shallow and is filled with a mass of large and small globules taking the fat stain. Fissures and holes left in this mass probably represent cholesterin crystals which have been washed out of the section. The cornea shows very little change, except the scar of the old wound above, with a few superficial vessels. Bowman's membrane stains diffusely red. The iris is atrophic and shows a good deal of fat in and between the cells.

The lens is slightly cataractous but shows no fat deposits. Back of the lens, the completely detached retina is fused with a dense membrane. The inner scleral lamellæ from Schlemm's canal back to the equator show a deposit of fine fat globules. No areas of necrosis in sclera or cornea are to be seen. The vitreous was washed out in making the sections and stains of material from the vitreous unfortunately miscarried. In the posterior segment, the sclera shows some large globules of fat in the lymph spaces around the posterior ciliary vessels. There is no diffuse fat impregnation of the sclera in this region nor any necrosis such as Meesman and Jaensch described.

Summary.

As in the few other previously reported cases, the yellow material proved to be a mixture of fats and cholesterin situated in the anterior chamber, iris and inner scleral lamellæ. The cornea was not much involved. The cause of this peculiar fat deposit is largely a matter of conjecture. It has been suggested that the fats are freed in the breaking down of exudates or blood in the eye, or that they are formed from cholesterin in cases with a high blood cholesterin content. The extreme rarity with which such a marked infiltration occurs as to be clinically visible, would indicate that some other individual factor, perhaps an abnormality in fat metabolism, must be involved. Von Szily thought the rise of tension was perhaps a factor, acting by paralyzing the normal elimination of the aqueous. Glaucoma was present in two of his cases and in Jaensch's case but not in Meesman's or the present case.

Since the normal cholesterin content of the vitreous is only .0048% (Jess) as opposed to .099% in the blood, the deposit of cholesterin in the vitreous in states of hypercholesterinemia is only conceivable in eyes with a damaged ciliary epithelium which can no longer exert its selective filtration on the blood constituents, as apparently happens in synchysis scintillans. Von Szily thought arteriosclerosis played a part, but Meesman's, Jaensch's and the present case were young and healthy persons. Aschoff, who examined von Szily's material, said that it suggested an individual diathesis or peculiarity of fat

metabolism, and in the present state of our knowledge, this is as much as can be said.

Since all eyes affected with the condition have been practically blind, it is of little practical importance. The only object of the present paper is to call attention to the existence of such a condition and to the value, where this, or any other abnormal fat deposit is suspected, of using gelatin embedding so that fat stains can be made, as this will undoubtedly increase our knowledge of the disposition of fat in the eye.

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FAMILIAL MACULOCEREBRAL DEGENERATION IN HALF BROTHER AND SISTER.[1]

By Dr. S. JUDD BEACH, Portland, Me.

THE following cases of so-called familial maculocerebral degeneration would be of interest if only for the fact that they show slight mental changes in the adolescent form. Hitherto this form has been said to be free from these complications which characterize the juvenile type. Of still greater importance, however, is the occurrence of this disorder in a half brother and sister, in this instance the children of the same mother but different fathers. Both fathers, by an extraordinary coincidence, had furthermore had normal issue in previous marriages. Other instances reported have all been members of the same generation of a family, having the same parents.

The family history, for which I am indebted to Dr. C. B. Sylvester, shows nothing remarkable regarding the mother of these children except that two of her sisters died of tuberculosis. The mother married first the husband of her deceased sister, and had one child, a son, who is Case No. 1 of the group. This husband, by his previous marriage with the sister, had also had one child, a girl, who, as just said, shows no signs of eye trouble.

For her second husband the mother married another widower, unrelated to the first husband, and living in a different town. Her marriage to him resulted in four children, of whom the first, a girl, is Case No. 2 of this group. The other children are well and have normal eyes. In his previous marriage, this father had the same number of children, four, all as stated, well and free from ocular disease.

[1] Read at the American Ophthalmological Society, June, 1926.

In short, the fathers of the two affected children had both been previously married and had normal offspring. Yet each had a child with familial macular disease as a result of his marriage to this woman who was herself unaffected.

Course.

The following description of this symptom complex is abstracted from Oatman (1), who named it "Maculocerebral Degeneration (familial)." He characterized it as a degenerative process of the macula frequently associated with a similar process in the brain. It is familial, but not hereditary. That is, it attacks brothers and sisters but is not transmitted to posterity. He describes two types. (1) In the maculocerebral type both retina and brain are attacked. (2) In the macular type, the pathologic changes are limited to the retina.

In the early or maculocerebral type, the patient appears normal till second dentition (6–7 years). (a) Then failure of vision and intellect begins. (b) Simultaneous atrophy and pigmentation develop in the macular region of both eyes. (c) Central scotomata for red and green are usually reported, followed by failure of central vision. (d) Mental deterioration may result in imbecility. Convulsions are common.

The late, or macular, type is distinguished (a) by beginning later, usually at puberty (14–16 years), and (b) by not affecting the brain. Epilepsy is absent.

To this last rule the present cases are exceptions.

Case Reports.

Case 1.—A male, 28 years old, is well developed and presentable. At 14 years of age he noticed that he was unable to read work on the blackboard. At 16, he became aware that something was wrong with his eyes. At 18, he developed epilepsy. This and his failure of vision increased for five years. At 23, he was put on bromide and has since had but one convulsion. He thought his vision improved slightly, but has since remained stationary. He now has vision sufficient for work as a day laborer, and is able to

read large type. Refraction shows low hyperopic astigmatism.

Fundus.—Through the undilated pupil the only fundus change to be noticed is a curious luster, but after dilatation this luster appears due to a depigmentation upon which the pigment appears as a fine dust. The affected area extends below the macula on both sides, but is not perfectly symmetrical. It is sharply bounded from the rest of the fundus, which shows no changes. There is no evidence of arteriosclerosis.

Fields.—The right eye shows slight concentric contraction, with a central scotoma for red and green. In the left eye the fields are nearly normal, and no red-green scotoma could be demonstrated, though it may have been present.

He is considered odd.

CASE 2.—Half sister of the preceding, is a comely and healthy looking girl, 19 years old. She left school three years ago because of failing vision. She had been an exceptional pupil and was much distressed not to carry on her work. Recently, she has been subject to epileptiform seizures, but has benefited by general treatment. Her Wassermann reaction is negative. Her tonsils have been removed.

Fundus.—Her fundus is normal except for macular changes, almost symmetrical, extending below in a vertical oval. The area is grayish-yellow in color, peppered with pigment in fine granules somewhat irregularly linear in distribution. The area involved is a trifle larger than the diameter of the disk. There is no evidence of arteriosclerosis.

Field of Vision.—Both eyes show a central scotoma for dull red but not for green. The patient is, however, able to recognize brilliant red.

Vision.—Right eye $\frac{20}{100}$; left eye $\frac{20}{200}$. Refraction under homatropine: right eye $+.25$; left eye $+.50+.25 \times 60$.

With regard to her mental condition, her mother states that after the age of twelve she seems never to have grown up. Although perfectly able to do her work creditably in school, she acted towards other children like a child of twelve. Customers in places where she worked found her childish, egoistic, and confiding. Nevertheless, a mental test given by an experienced school psychologist rated her as having high adult intelligence.

The three younger children of this marriage, a boy of 17, a girl of 15, and a boy of 14, I examined and found with central vision $\frac{20}{20}$; fields and fundus normal.

SUMMARY.

The present cases have the following characteristics common to the group. (1) They were familial. (2) Both patients seemed normal at birth. (3) Both were attacked at the same age (puberty). (4) In both the macular changes were almost symmetrical in the two eyes, and were (5) progressive. (6) Both showed central scotomata for red or for red and green.

They were atypical in that, with the time of onset of the late type (puberty), they combined mental changes and convulsions, which have been said to be confined to the early cases.

DUBIOUS BORDER-LINE CHARACTERISTICS.

Under these circumstances, there is a temptation to interpret them as border-line instances connecting the two groups. While this interpretation may turn out to be correct, before accepting it, nevertheless, two objections must be met. First, the cerebral changes, which seem offhand to relate these cases to the juvenile group, do not indicate a true degeneration but represent merely a cessation in development. In other words, after the onset of the disease, instead of deteriorating towards imbecility the mental progress of the present patients continued normally, but their personality ceased to advance. Thus, at the time of examination, the girl had high adult mental rating, but the social outlook of a child of twelve. She was childish and self-centered, wishing to talk of her affairs and her clothes to strangers who visited the office where she worked. Yet she attained high rank as long as her sight permitted her to go to High School. Psychiatrists are familiar with such an abnormality accompanying true epilepsy, to which the name "epileptic personality" has been applied. This history, it will be seen, gives no evidence of mental degeneration such as occurs in the early form, in the sense that the children developed some faculties which they subsequently lost. On the contrary, there was merely a partial arrest of development, so that they failed to acquire the social balance appropriate to their years.

Although these cases controvert the statement that convulsions never occur in the late or macular variety, this evidence is offset by a second, and more serious testimony, against the unity of the two forms of this degeneration. This is the negative observation that both have never yet been reported together in the same family. *If they are actually manifestations of the same disease, both would be expected sooner or later to occur together.*

Connection with Analogous Degenerations.

Thus to classify together these two types has never received universal acceptance. Paton (12), at the English Speaking Congress, has just reiterated the contrary view that the early form of this disease belongs in the group called by Vogt (14), Gifford (3), and others, juvenile amaurotic idiocy, and doubts the wisdom of putting with it the late form commencing about puberty. Similar opinions have been expressed by F. E. Batten and Mayou (4), Holmes (12), and Nardin and Cunningham (6). The pathological evidence offered by Batten and Mayou to substantiate this conception was attacked some time ago, in a posthumous paper by the late George Coats (8). The lack of general enthusiasm for it, however, is due more to the feeling expressed by Parsons in the discussion, namely, that it is regrettable to attempt to merge these groups since amaurotic idiocy is one of the most sharply defined clinical entities. This argument applies in a measure to the classification with these cases of certain adult and senile macular diseases made by R. D. Batten (7), and to the relationship that Ichikawa (13) felt to exist between them and pigmentary degeneration of the retina. Aside from the occurrence of this last disease in idiots, the resemblance lies chiefly in the extension of the pigmentation toward the periphery, said by Stargardt (11) to be a common late development in the form of symmetrical macular degeneration without dementia. Here it is distinguished from pigmentary degeneration because, as in the series reported by Alkio (10), these patients are apt to see better rather than worse at night, and have the characteristic central visual defect of cerebromacular disease. The diversity and dissimilarity of the mal-

adies with which various writers have tried to ally these cases shows the impropriety of classifying profound nervous disorders according to almost incidental macular or even retinal changes. Stargardt says that in one family these patients are all free from psychic disturbance or else all have it. The present cases are no exception, and cannot, without further evidence, qualify as missing links.

Heredity.

To return to the hereditary aspect of this disorder, it is customary to say that the heredity is not understood, or else that the familial degenerations do not follow the Mendelian laws. Most observers are satisfied that the disease has not occurred in the same family except in the particular generation under discussion. Some infer still further that as all examples have been hitherto reported in siblings in the classical sense, that is, in one generation with the same father and mother, the responsible factor is the joint product of two otherwise normal parents.

Here a somewhat different conclusion is suggested. These children had the same mother but different fathers. The two fathers were absolutely unrelated, lived in different communities, and were quite unlike in all respects. The question then arises whether in these cases the fault was not wholly maternal, and not, as just said, the product of some faulty union between the maternal and paternal elements. If this were true, then, this mother would have been liable to children showing this form of degeneration regardless of whom she married. The tendency to the disorder, then, would not be a joint product, but would be transmitted through a single parent, in this case, the mother.

It may, moreover, turn out that we have been too ready to accept the tradition that this disease does not recur. Biologists place no confidence in clinical observations regarding heredity. In this abiotrophy, such mistakes are easily possible. In the first place a disability which does not incapacitate the victim for ordinary labor, or for reading large print, might readily have escaped remark, especially in the pioneer days. Then Stark (14), on some ground which is not men-

tioned, considers the quite analogous degeneration, amaurotic family idiocy, as a recessive characteristic. Finally, Alkio, in the report previously quoted, gives a pedigree, including one family of which several members suffered unmistakably from the adolescent type. Nervous disorders, mainly epileptic, are repeated in preceding and subsequent generations, suggesting the inheritance of a tendency which, under proper circumstances, resulted in this disease. This table, in spite of one generation complicated by hereditary syphilis, throws suspicion on the current views of the inheritance of this disease.

Conclusion.

This report presents two cases of the macular type of Oatman's maculocerebral degeneration. They were unusual in that while adolescent in type they nevertheless had epileptiform seizures, and showed psychic development partly arrested at the onset of the disease. While this is the first evidence indicating any relationship to the younger type aside from the macular changes, it cannot be considered conclusive proof.

Since this mother had offspring afflicted with this degeneration by two husbands, both of whom had normal issue in previous marriages, it might be inferred that the fault was maternal. This is at variance with the tradition that the tendency to this disorder is the joint product of the two parents, confined to one generation of their offspring. Considered with Alkio's family, in which some aspects of the disease appeared through several generations, it supports the biological view that familial diseases are transmitted in the regular way.

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REPORT OF THE SECTION ON OPHTHALMOLOGY, NEW YORK ACADEMY OF MEDICINE.

By Dr. THOMAS HAYES CURTIN, Secretary.

MEETING OF DECEMBER 20, 1926. DR. CLYDE E. McDANNALD, CHAIRMAN.

Dr. H. W. Wootton presented a case of **Adeno-carcinoma of the upper lid extending into the orbit.** (Published in full).

Discussion: Dr. Goldstein. Four years ago I presented a similar case in which an exenteration had to be done. It was necessary to use in the orbit skin grafts from the legs and the socket healed within three weeks.

Dr. Cohen: I saw this case with Dr. Wootton and in the beginning it looked like gumma of the upper lid, so that specific treatment was instituted but with no result. The tumor spread and a section was made, which was diagnosed, microscopically, as fibro-adeno-carcinoma. I believe that this arose from the conjunctiva rather than from the Meibomian glands.

Dr. Knapp: I had the opportunity of seeing this patient through the courtesy of Dr. Wootton, and the case struck me as being typical of the reported adenomas of the upper lid. Its most striking feature was its bony hardness, at the same time the lid was not involved. I think this hardness and the location speak against Dr. Cohen's suggestion that the process originated in the conjunctiva. The extension in the orbit and the rapidity of growth of this tumor are interesting and unusual.

Dr. Wootton, in conclusion, said that he did not agree with Dr. Cohen that the tumor arose from the conjunctiva, for the conjunctiva was intact at the time of the operation.

Dr. George H. Bell presented a girl aged 10 with **Vascu-**

larized gelatinous plaque in angle of anterior chamber. This patient has been under treatment since last June. Slit-lamp reading is as follows:—Cornea: anterior surface presents many small superficial maculæ. Parenchyma: deep blood vessels; some obliterated. Posterior surface: bedewing, organized exudate below causing anterior synechia. A few precipitates below. Anterior chamber: floating particles, dust-like. At lower angle: the angle is obliterated and from the iris arises a vascularized gelatinous exudate. Iris is adherent below and contains new formed blood-vessels. The pupil is oval. The gelatinous plaque runs from 2 to 7 o'clock and is now 3*mm* broad at its broadest part. The patient's Wassermann was negative, but she has some of the characteristic signs of congenital syphilis. Tuberculin test was not altogether positive, but we are giving her tuberculin as well as mixed treatment. The mass is absorbing. Dr. Bell is of the opinion that the process is due to congenital syphilis.

Dr. Bell presented a man, age 38 years with **Xerosis conjunctivæ of both eyes.** There is a triangular patch on each side of the cornea in the horizontal meridian. The surface of the patch glistens like fat, is of whitish color and is covered with a dry foam. These patches are not moistened by tears. The cheesy secretion from the patches contained epithelial cells, leucocytes and the xerosis bacilli. Patient complains of burning of eyes and suffers from night blindness. Vision in O.D. $\frac{20}{40}$. As there is some involvement of the cornea of O.S. vision $\frac{20}{40}$. Xerosis appears in this case as a symptom of a general disease. The patient had a septic mouth, diseased tonsils and a toxemia of the intestinal tract, which was evidenced by constipation and a large amount of indican in the urine. His diet was bad, composed mostly of starch and poor in vitamins. He was placed on a proper diet; starch and protein not mixed at one meal, they may, however, be taken at different meals. Dr. Bell hopes to clear up the focal infection, and locally intends to use 1% nitrate of silver several times a week on the white foaming patches and zinc drops at home.

Dr. Simon L. Ruskin (by invitation) read the paper of the evening, entitled: **The anatomic relationship of the eye to the accessory sinuses of the nose.**

Developmentally, we find the eye, nose and mouth having a common innervation coming from two great nerve trunks, the trigeminal and the facial. The nerve connections for these three regions are so closely related that it is not surprising to find a close clinical relationship. The three roots of the trigeminal nerve, the ophthalmic to the eye and nose, the maxillary to the nose and mouth and the mandibular to the mouth and jaw have a common ganglion the Gasserian. One can therefore readily see the course of reflex irritation from the crypts of the tonsils innervated by the maxillary division to the ophthalmic division giving sensibility to the eye.

In addition, we have attached to each of the three large trunks of the trigeminal a small ganglion supplying vegetative connections; the ciliary to the ophthalmic division, the sphenopalatine to the maxillary and the optic to the mandibular division. These three ganglia are interconnected and so we have an intimate vegetative connection between the eye and the nose and throat.

Finally we have a relationship between the muscles of the eye with that of the nose and throat. The facial nerve which supplies the accessory muscles of accommodation also has connection with the nasal ganglion through the greater superficial petrosal nerve.

An animal confronted with its prey reacts with his whole trigeminal, facial and vegetative systems. The stimulation of the nasal fibers passing over the greater superficial nerve will call forth an increase of the accessory muscles of accommodation. Higher up in the scale of human development we find disease processes in the nose calling forth a purposeless increase in the accessory muscles of accommodation with resultant ocular headaches, asthenopia and possibly scotoma scintillans. In addition the influence of the nasal ganglion on the ciliary ganglion is a probable source of symptomatology with a possible bearing on refraction. The fact that the pain of glaucoma can be relieved through the nasal ganglion suggests a distinct relationship.

DISCUSSION: DR. KNAPP. Dr. Ruskin has presented an extremely interesting but difficult subject and we are indebted to him. While I do not feel capable of discussing the anatomic conditions in question, I should like to say a few words in

connection with some clinical deductions which the speaker has made. It seems to me that the nasal ganglion might have a very important bearing upon anomalies of accommodation. I have great sympathy with Dr. Ruskin's scepticism on the value of nasal surgery in cases of retrobulbar neuritis where the nose findings are perfectly negative, yet I am not able to follow his conception of a retrobulbar neuritis originating from an irritation of the nasal ganglion. A process of this kind should run a course entirely different from the usual one and should always be accompanied with very severe pain. I am much interested in hearing of the relation of the nasal ganglion to glaucoma. I would like to ask Dr. Ruskin whether he has observed any change in the ocular tension after treating the nasal ganglion, and will he be good enough to explain a little more in detail exactly the method by which he anæsthetizes and injects the nasal ganglion?

DR. CRIGLER: Perhaps obscure conditions of the eye can be traced to this nasal neurological disturbance, bullous keratitis, for example. I have a case under observation; there was pain, striated cornea, trophic disturbance and the X-ray showed that the anthrum was involved. The corneal condition was relieved after operation.

DR. SCHOENBERG: Sluder's technic to anæsthetize the nasal ganglion is very simple. A confrère injected carbolic, alcohol, etc., for patients of mine. One case resulted in paralysis of the sixth nerve for eight months. Another case has paralysis of the sixth nerve. There is no doubt that there is a connection between the spheno-palatine ganglion and functional disturbances of the eye; but we must go carefully.

DR. COHEN: I have seen a case of sixth nerve paralysis following an injection of the ganglion. We must be careful in giving this injection.

DR. HOUGHTON: Dr. Ruskin is to be congratulated on his paper. The anatomical specimen shows the relationship of direct toxicity of the sinus affecting the optic nerve from the peculiar fact that it may result in one case and not in another.

DR. HUBERT: Professor Schaffer, who has written much on the spheno-palatine ganglion, says that it has nothing to do with pain, it being a purely sympathetic ganglion.

DR. RUSKIN: In answer to Dr. Hubert, clinically, I have re-

lieved pain by injection of the nasal ganglion. There is a difference between histological slides and clinical experience. Retro-orbital neuritis without pain probably has pain somewhere else in the body and is associated more with purulent cases.

In answer to Dr. Knapp I would say that, not being an eye man, I have never taken tonometric readings of glaucoma cases where the pain was relieved by injections of the sphenopalatine ganglion. Injection through the posterior palatine canal is simpler than injecting the nasal ganglion directly, if there are nose defects to be contended with. I am conservative in giving injections, as in many cases local application will relieve. I have never found a permanent paralysis of the sixth nerve, nor have I heard of any being reported. Too much injection of alcohol will give trophic effects.

MEETING OF JANUARY 17, 1927. DR. CLYDE E. MCDANNALD, CHAIRMAN.

DR. BEN WITT KEY presented a case of **Implantation cyst of the iris,** in a man 75 years old. He came to the New York Eye and Ear Infirmary in 1918, when a combined extraction of the cataract of the left eye was performed. The operation was without event and a secondary membrane was incised shortly afterwards. With correction vision was $\frac{20}{30}$. He returned one month ago stating that the vision of this eye had gradually become reduced since about one year ago. On examination the eye is entirely quiet, the cornea is transparent, the anterior chamber is deep and the aqueous clear. Filling the entire coloboma and extending over the pupillary area almost to the lower margin of the pupil is a large pearl-like cyst seemingly an outgrowth from both iris pillars. The iris is normal in appearance and reacts to light. The remaining pupillary area is clear. The tension of the globe is normal. The ophthalmoscopic examination revealed a transparent media and the fundus was apparently normal. Vision with correction $\frac{20}{100}$. With the slit-lamp the iris cyst presents a beautiful picture—with definite attachment to the iris substance, and apparently unfolding from the iris pillars.

DR. KEY presents this case first, because these cases are fairly rare in occurrence; second, because of the large and

apparently typical implantation cyst without any inflammation reaction or increased intra-ocular tension; third, because of the important question of the method of operation. I believe the usually accepted theory in the development of an implantation cyst is that of an ingrowth of epithelial cells from penetration of the globe—although other theories have been presented. It is highly important to remove every portion of the cyst. The method of procedure in removal of it, therefore, is of the most importance at this time. It consists in making a keratome incision boldly into the cyst, or with a Graefe knife to make an incision in the peripheral limbus or in the plane of the route of the iris.

DISCUSSION: DR. WOLFF stated that he had seen a case which was not very encouraging. The cyst recurred and its removal was followed by secondary glaucoma.

DR. CURTIN asked Dr. Key why he thought of removing the cyst when it did not seem to obstruct the pathway of vision entirely and there being no tension, inflammation or evidence of secondary glaucoma. He personally felt that operation was contra-indicated.

DR. SAMUELS said that that was the point he was going to bring up. He also felt that operation in this case was contra-indicated.

DR. BARNETT stated that he would not advise aspiration of the cyst with the injection of any irritating fluid. He said that he had conducted experiments with rabbits in which the injecting of a few drops of a mild solution of phenol was sufficient to destroy the eye.

DR. CHARLES GLUCK (by invitation) presented a case of **Bilateral irido-cyclitis in a boy 11 years of age with excellent result after treatment.**

DR. W. B. WEIDLER reported a case of **Intra-ocular sarcoma in a child. Old staphylomatous eye.** Illustrated by photographs, microscopic slides and macroscopic specimen. The parents noticed the right eye of the patient, aged 5, looked peculiar at birth.

On examination, there was opacification of the entire cornea with staphyloma. There was some tension of the globe and no vision or light perception. The condition had been getting worse and more marked in the last four months. Child's

general health was good. There was a slight swelling in centre of forehead and there appears to be a new growth in the frontal bone. Enucleation was done and the eye was examined by Drs. Ewing and Coca who reported it to be a glio-sarcoma of the retina. There was a recurrence of the tumor in the mouth on the left side in about one month after the enucleation. The child was referred to the Memorial Hospital where she was given radium treatment, but it did not stop the increase of the tumor. In about two months there was a growth in the orbit and on the forehead. Five months after the operation there was a large tumor mass almost filling the mouth, making swallowing of food difficult. The tumor ulcerated through the skin at the middle of the jaw on the left side. There was a mass filling the orbit and projecting about two inches outside of the orbit. The small mass in the center of the forehead had grown to be a dense, hard mass. The child had lost much weight, being reduced to a mere skeleton.

The left eye was normal, but a tumor growth had appeared in the left orbit. The child died about a month ago but an autopsy was refused.

DISCUSSION: DR. CONRAD BERENS said that he always considered the type of tumor described by Dr. Weidler, and the tumors described by Drs. Parker and Stokes as neuroepiblastic growths arising from the retina, and mesoblastic tumors. Dr. Weidler's specimen as well as Dr. Parker's specimen were so advanced that it is difficult to say whether the tumors originated in the retina or choroid but it was his opinion that all these growths had apparently originated in the retina. He thought it strange that mesoblastic cells of the choroid should give rise to tumors more frequently in later life than in early life and that retinal mesoblastic cells of the blood vessels should apparently give rise to tumors only in early life. There is apparently no valid reason, however, why the so-called gliomas could not be associated with the development of the blood vessels of the retina. It is strange if these growths arise from the blood vessels that we seldom, if ever, see epiblastic or mesoblastic tumors arising from the retina even in degenerated, chronically inflamed eyes. It has been his experience frequently to encounter sarcomas of the choroid in chronically inflammed eyes of older people, but so-called

gliomas never. He believes that this point possibly indicates that this type of retinal tumor has had some connection with the development of the retinal epiblastic cells rather than the mesoblastic cells of the retinal blood vessels. Until the exact cells from which the tumors arise can be actually seen it may possibly avoid confusion for pathologists to speak of tumors of the retina and choroid of mesoblastic or epiblastic origin rather than label each growth to conform with a preconceived idea of what he should find.

Dr. Thomas H. Curtin presented a case of **Traumatic rupture of the globe with expulsion of the lens into the conjunctival sac.** On November 28, 1926, I was called to see Mrs. A. W., age 74 years, whom I had seen 6 months previously at my office, at which time she had showed an argyrosis of both eyes; a double iridectomy had been performed for the relief of glaucoma, cataracts were present in both eyes, her vision was light perception in all fields in the right eye and light perception in the outer field in the left eye. The patient had fallen down stairs, striking her right eye on the edge of the newel post of the balustrade, injuring her right eye so that the family physician felt that the eye should be enucleated. On arrival I found the eye-lids and skin surrounding the eye-ball markedly swollen. The eye-lids could not be opened sufficiently to get a good view of the entire globe; but from what could be seen, the cornea was clear and the anterior chamber filled with blood. The tension, by finger palpation, appeared to be about normal.

Under the conditions, taking into consideration my previous examination of this patient in which the vision of this eye was only light perception, I felt that enucleation would be an unnecessary procedure and of no material value, so hot compresses were ordered to be continued indefinitely.

On the last day of December, 1926, she appeared at my office. The swelling of the eye-lids had entirely disappeared, the eye-lids could be opened fully. The ocular conjunctiva was still slightly congested and hemorrhagic. At the upper limbus, about *2mm* below the corneoscleral margin and extending from about 2 to 10 o'clock, could be seen a rupture of the sclera and conjunctiva. During the course of my examination, the upper lid was everted; and a small, black,

round body appeared, which was about ⅜ of an inch in diameter; and about ¼ inch in thickness. Except for its color, it resembled one of the old time eye-stones, used by the public for the removal of foreign bodies. In fact we asked the patient if an eye-stone had been used and received a negative answer. Upon further examination it was determined that this was the lens or nucleus of the lens itself which had emerged during the rupture of the sclera and the conjunctiva, either at the time of the accident or at a later date. My opinion is that it was at the time of the accident.

DISCUSSION: DR. WOLFF reported that he had a case of glaucoma with cataract in which a preliminary iridectomy had been done. After the removal of the bandages from the eye, it was found that the cataract had been expelled from the eye and that the wound had healed naturally.

DR. JULIUS WOLFF read the paper of the evening, entitled **Three cases of progressive amaurosis of retro-bulbar origin. Recovery of vision with foreign protein treatment.** These cases were examined and treated in conjunction with Dr. Joseph H. Globus of the Neurological Staff of Mount Sinai Hospital.

They presented great difficulty in diagnosis to expert ophthalmological and neurological consultants, one case having been operated upon for suspected brain tumor, and in another an operation for supposed pituitary tumor had been decided upon before the treatment with foreign protein was resorted to. In the latter case an intercurrent febrile condition just before the expected operation brought on the first signs of improvement in vision which had been steadily growing worse for months. This fact suggested postponement of the operation and the use of foreign protein. At least two of the three cases were diagnosed as post-encephalitic complications. The paper was summarized as follows: The points that these three cases have in common are: (1) Progressive loss of vision, first in one eye, then in the other, without intra-ocular changes, even at the height of the development of the clinical manifestations. (2) The development of gradually enlarging central scotomata. (3) The development of hemianopsic fields; even though only relative in degree, and requiring careful perimetric examination for their detection. (4)

Diagnostic difficulties presented, even to expert ophthalmological and neurological consultants. (5) The lack of response to the usual forms of treatment of retrobulbar lesions of the optic nerve. (6) Absence of a toxic etiology. (7) The prompt and progressively favorable response to the intravenous injection of typhoid vaccine. While these three cases, especially in the absence of pathological evidence, are far from sufficient in number to draw definite conclusions therefrom, they have nevertheless points enough in common to suggest a clinical entity which might be designated a "Chiasmal Perineuritis" that may exist alone or in combination with other neurological manifestations.

DISCUSSION: DR. JOSEPH H. GLOBUS. There is nothing I can add to the report of Dr. Wolff. It is complete. There is a great deal to be said regarding the development of lesions. Central neoplasms must show signs of intra-cranial pressure and have the three cardinal symptoms: 1. Vomiting, 2. Headache. 3. Papilloedema. Of course there are intracranial tumors that do not give these symptoms, such as tumors of the pituitary body. In all these cases there was no evidence of a tumor. No paretic symptoms, showing that there was no compression of the brain. All evidences are against tumor. Someone spoke of inflammatory lesions. There is no grouping of symptoms in inflammatory conditions of the brain. There is a multiplicity and complexity of symptoms. Multiple sclerosis is questionably inflammatory. Inflammatory conditions of the brain can be arrested and are self-limited. Degenerative lesions are the opposite. In these cases we were dealing with a special-wide spread inflammatory condition.

DR. WOLFF said in conclusion, that he was encouraged and will be tempted to use this form of treatment again in obscure cases of retrobulbar neuritis.

REPORT OF THE TRANSACTIONS OF THE OPHTHALMOLOGICAL SECTION OF THE ROYAL SOCIETY OF MEDICINE.

By Mr. H. DICKINSON, London.

A meeting of the Section was held on Friday, 14th of January, when the chair was occupied by Mr. Ernest Clarke, C.V.O., its President.

Clinical Cases.

Sarcoma of Orbit.

Mr. Cole Marshall showed a boy who had a sarcoma of the orbit. He removed a growth in November last, and after Christmas the patient presented himself showing a recurrence in the upper and outer angle of the orbit. It had increased rapidly and taken on an appearance typical of sarcoma. The microscope showed it was spindle-celled sarcoma, and he now asked whether exenteration of the orbit should be carried out, especially as a definite bruit was heard over the swelling, which might mean an added difficulty.

Mr. J. H. Fisher urged exenteration against which he could see no objection. There might be a good deal of hemorrhage at the operation, but by operating quickly and plugging the orbit one could obviate any cause for alarm. If this were not soon done, the globe would probably be so much displaced in a few weeks that the cornea would slough.

Mr. Montague Hine spoke of an almost identical case of his own, also in a boy. Early in the year 1926 there was a small polypoid growth in the upper and inner angle of the orbit. It grew so rapidly that he thought it was not malignant, and therefore his removal of it had not been quite so complete as it

would have been had he not regarded it as innocent. The report, however, was that it was endothelioma. It grew again, and the growth he now took away thoroughly was encapsuled. Three months later it again recurred and grew rapidly, and during a three weeks' delay in getting the patient into hospital the growth had indented the eyeball, and was extending over the brow. At consultations it was thought the patient would die, whatever might be done. However, early in September, Mr. Hine performed a complete exenteration, and it was followed by eight applications of deep X-ray therapy. So far, there had been no sign of recurrence, and the boy was in good health. He did not advise X-rays alone in such cases, only following surgical removal.

Cholesterin Crystals in the Anterior Chamber.

Mr. Bernard Cridland showed a patient whom he first saw in 1913, when he knew the vision of the eye in question had been faulty for six years; it was the subject of retinitis proliferans, with extensive detachment of the retina. In 1919, when he next saw the patient, that eye was blind. In December (last month) the man reported that in October while cycling, he was struck in the blind eye, but it gave little trouble. On December 14th he awoke at 4 A.M., with great pain in that eye, but after four hours it ceased, and the appearance then was the same as now, *i.e.* showing the cholesterin crystals; but latterly the crystals had become more moveable. The patient's cholesterin level was 211*mg*%, which was somewhat high but not pathological.

Mr. Humphrey Neame referred to an eye which had been sent to him. It had been blind a considerable time, and the whole anterior chamber was filled with cholesterin. He thought the origin of the cholesterin in these cases was a hemorrhage.

Angioid Streaks of Retina.

A case having this appearance was exhibited by Dr. O. G. Morgan. In the right macula there was marked mottling, and petechial hemorrhages above, giving an aspect resembling that of retinitis circinata. The case confirmed the view of

those who considered that angioid streaks, retinitis circinata and massive exudate were allied conditions and that they were associated with vascular degeneration.

Dermoid Tumors in Both Eyes.

Dr. David Wilson showed a girl, aged 13, with dermoid tumors in both eyes; she also had a supernumerary auricle at birth. Probably both abnormalities were due to the pressure exerted by amniotic band.

Foreign Body in Vitreous.

Mr. J. W. Tudor Thomas showed a case of foreign body in the vitreous. The patient was a woman, aged 26, and he first saw her a month ago, when she said that five months previously she was standing near a man who was chipping the top of a stone wall, when a piece struck her right eye, and the eye bled. It remained red for three weeks, during which time she herself treated it with boracic lotion. Previously to the accident she had noticed a black streak before that eye. It did not now cause her much discomfort. The vision in that eye was now the same as it was when first seen, *i.e.* partly, with correction $\frac{6}{12}$; left eye $\frac{6}{12}$ partly, with correction $\frac{6}{9}$. The right eye showed traumatic mydriasis, and there was a small scar in the conjunctiva and sclera, *2mm* from the cornea on the inner side. In the lower and anterior part of the vitreous was a minute foreign body, opaque to X-rays, and near it a faint web of localized opacity. On the outer side of the macula was an area of choroido-retinitis, and a scotoma extending from 15° to 40° to the nasal side of the fixation spot and, vertically from 5° to 60° below the horizontal plane. Higher in the retina was a very small pigment spot and a small hemorrhage. There was no sign of iritis nor siderosis, though the foreign body contained iron. The foreign body took on a twisting movement when a large horse-shoe magnet was brought to the lower eyelid, and the exhibitor said that on general principles perhaps the foreign body should be removed, but possibly the patient was better off in her present state, temporarily at least, than after incision of the sclera. A question arose as to how the somewhat extensive choroido-

retinal change was produced. Did the foreign body strike the retina at this spot and rebound into the vitreous? If so, was the impact on the retina the cause of the fundus picture? Owing to the area involved he thought it likely that the changes were produced by a transmitted force acting through the vitreous. The foreign body did not measure more than *2mm* each way, and was of such light weight that it remained suspended in the vitreous, and in five months had not gravitated to a more solid resting-place on the retina.

Mr. M. H. Whiting said it was not rare for an eye having in it a foreign body to remain quiet for a considerable time. In this case he advocated removal of the foreign body by means of a magnet; it could be done, he thought, without inflicting any additional injury.

Mr. Cridland thought the foreign body could be brought round the edge of the lens into the anterior chamber, removal being carried out from the latter site, so avoiding operating through the sclera.

Dr. H. Moreland McCrea read a paper entitled **Retinal Petechiasis, a Clinical Entity of Auto-Intoxication.** Dr. McCrea said the purpose of his paper was to urge that a condition now included under the term retinal hemorrhage—for which group of cases but little could be done—should be regarded as a separate clinical entity, the condition to which he gave the name petechiasis. Mr. Ernest Clarke, the President of the Section had already made some allusion to the question under the term hemoflux. Dr. McCrea understood by hemorrhage the rupture of a vessel and the escape of its blood into surrounding tissues. Hemorrhage in the retina was seen in people who were past middle life and whose vessels showed marked degenerative changes; their blood pressure was, in almost every instance, high, especially the diastolic. But little could be done for hemorrhagic changes in the retina when the cause was degeneration of vessels. Neither could much be done for retinal thrombosis. A third retinal condition was what he termed petechiasis, and at first this looked like retinal hemorrhage. This, he contended, differed from hemorrhage

in the following particulars: it was an exudation of blood without rupture of vessel; its pathology was different from that of hæmorrhage, as also were its clinical history and appearance. It required a different treatment, and when the treatment was correct, recovery might ensue. Petechiasis was an exudation, but it was difficult to enter into its pathology, as he was not aware of an eye damaged in this way having been examined pathologically; but the ophthalmoscopic findings afforded a good clue. In typical examples, the disc presented what looked like blood splashes as if some blood stained mud had been thrown at the retina near the disc. In some patients the splashes were confluent and the vitreous cloudy, thus resembling a true hemorrhage. Sometimes the blood could be seen to traverse the exudation. Krogh, of Copenhagen, had shown that the capillary walls were capable of stimulation, the response to such stimulus being either a contraction or a relaxation; he also showed that increased relaxation meant enhanced permeability to the constituents of the blood plasma. Toxins circulating in the blood probably supplied such stimulus, and so splashes were facilitated.

If the view set forth in this paper was correct, it should be possible to discover the sources of infection, and to show that their removal arrested the retinal process; also if there were a recrudescence of the infection there should be a fresh retinal manifestation. These conditions had been fulfilled, as he showed in a number of cases, supported by slides. In one case, after treatment the retinal trouble had settled down for about six months, then there was a mild recurrence, and new splashes appeared in one eye. Previously all the patient's teeth had been removed and the tonsils had been examined by experts and accepted as satisfactory. His general condition was good, and there were no evident vascular changes, the blood pressure being still 118–76. On retracting the anterior pillar of the fauces on the left side pus exuded from the tonsil, and a small abscess was found there. Now that the electric ophthalmoscope was in such general use, he suggested that a routine retinal examination should be made by physicians, as it would result in these splashes being seen earlier, and the offending focus removed. At present the ophthalmologist only saw these cases when defective vision was complained

of. The organism mostly responsible for the trouble was a streptococcus, but in some the bacillus coli was present.

There was a striking difference between the clinical history of petechiasis and hemorrhage. In the former it was not necessary for the high blood pressure accompanying hemorrhagic conditions to be present, and it might occur at any period from middle age onwards; the youngest in his series was aged 42. Also in the hemorrhagic type of case evidences of degenerated vessels elsewhere could be found, but not so in petechiasis. Moreover, for true hemorrhagic conditions there was little treatment, whereas in petechiasis the results of the correct treatment were excellent. If the source of infection did not prove to be removable, vaccines should be tried, though he had not much faith in them unless the source of infection could be removed. The vaccine used should be cultivated from the patient's own organism. Sources of infection in his cases were the teeth, the tonsils, the accessory sinuses, the ethmoid, and the urinary tract. A site of infection which was very liable to be overlooked was a pocket in the alveolus of the lower jaw, behind the wisdom tooth. Mr. Pallant had pointed this out.

Summarizing his 14 cases of the condition, Dr. McCrea said their ages ranged from 42 to 83, and their blood pressures were rather on the low side. One case only had any degree of albuminuria, none had polyuria. Marked improvement followed treatment in 10 of the cases, moderate benefit in 2, no improvement (but relapse) in 2.

Dr. G. A. Sutherland, discussing the paper, said that though there might not be degeneration of larger vessels in this condition there might be some alteration of the capillary structure, thus explaining the oozing. He would like a fuller statement concerning the bacteriology, but agreed that from the medical point of view the disease was of great importance, and Dr. McCrea's results of treatment seemed to justify the attitude he had taken up.

Mr. M. Hine referred to Mr. Foster Moore's recent paper on the significance of retinal hemorrhages, Mr. Humphrey Neame spoke of some experimental work on the controlling mechanism of the capillaries, Lt.-Col. R. H. Elliott and the President made hopeful allusion to the work Dr. McCrea was

carrying on, and MR. R. H. GREEVES said he thought the cases described should be regarded as a sub-group of toxic retinitis, the larger group embracing the diabetic and albuminuric cases.

DR. MCCREA briefly replied.

BOOK REVIEWS.

I.—**Cavernous Sinus Thrombosis,** by DR. WELLS P. EAGLETON, Newark, N. J., pp. 196. New York, The Macmillan Co. 1926. Price $4.50.

Most cerebral infections arise by retrograde thrombophlebitis and not direct by extension of the suppuration, so according to the author the infection of a dural sinus or venous radicle are the intermediary link and these suppurative lesions must be given due study. This thesis of the author is supported by 25 personally observed cases of cavernous sinus thrombo-phlebitis with 21 deaths (12 autopsy reports) and 4 recoveries. To this is added the report of the author's experience with jugular bulb thrombosis, orbital thrombo-phlebitis, arterio-venous aneurysm of the cavernous sinus, cases of lateral and of longitudinal sinus thrombosis.

In cavernous sinus phlebitis, a condition which should be regarded as a group of diseases, the author stresses the importance of early diagnosis long before the classical symptoms of exophthalmos, œdema of the lids and chemosis present themselves depending on whether the sinus is suddenly obstructed by an acute septic process or gradually by a compensatory thrombus. In the early diagnosis of the slow involvement of the sinus type (the most promising type for surgical intervention) the author suggests for study the path of entrance of the infection, the part first affected, the parts adjacently situated and secondarily involved, and the necessity of treatment of the phlebitis by drainage and placing the inflamed venous radicle at rest by ligature of the carotid artery. These important questions are illustrated by a study of the acute and chronic types of cavernous sinus thrombo-phlebitis, the route of infection, whether it be the anterior or ophthalmic,

pterygoid, sphenoidal, aural, tonsillar, carotid or mixed types. Diagnosis, Surgical Anatomy and Pathology, Treatment by Operation or Serotherapy and Vaccinotherapy are taken up in turn, and a general bibliography is appended.

The author has made an important contribution to a subject about which little has been known and which he has refused to regard as hopeless. His experience has shown that the subject is not so unusual as the small attention which is given to it leads one to suppose, and he has furnished a real advance to our knowledge. The study of these pages will be of great advantage to the general surgeon, to the surgeon specializing in the eye and to the neurologist, for the author has drawn attention to the possibility of early diagnosis of cavernous sinus thrombosis and in favorable cases relief by prompt though radical measures.

A. K.

II.—**Stillings Pseudo-Isochromatische Tafeln zur Prüfung des Farbensinn** (Pseudo-isochromatic plates to test color vision), 7th edition, by PROFESSOR E. HERTEL, Leipzig. Geo. Thieme. 1926. Price Marks 18.

This new edition brings changes in plates VI and VIII with new plates in groups XI and XII. The use of these plates aids not only the diagnosis of color blindness but also the determination of the type and degree of this anomaly. They help other methods as with spectral colors, and may also serve to detect malingerers. The facility with which color blindness can be discovered with the aid of these charts is well known. The improvements introduced in this edition are welcome changes.

A. K.

III.—**Tafeln mit Umschlagfarben zum Nachweiss von Relativer Rot und Gruensichtigkeit** (Plates with Changing Colors to Demonstrate Relative Red and Green Blindness), by PROFESSOR E. WÖLFFLIN, Basel. Geo. Thieme, Leipzig. 1926. Marks 5.80.

These plates are designed to detect individual differences in color perception, in submitting colors which are not the same in artificial light and in daylight. Thus the one with

exceptional color perception will detect a difference in daylight, the normal individual perceives it only by artificial light. The tests are so delicate that the directions for the examination must be carefully followed. The technical difficulties which the publication of these plates must have entailed are apparent, and their successful solution reflects credit on the author and publisher.

A. K.

IV.—**Précis de Technique Histo-Bactériologique Oculaire** (Laboratory Guide of Ocular Histological and Bacteriological Technique), by DR. Y. D'AUTREVAUX, chief of laboratory of Quinze-Vingts. With a preface by Dr. V. Morax, Paris. 160 pages with 22 illustrations. G. Doin & Cie. Paris. Fr. 30. 80.

This volume is an acceptable addition to the Biliothèque d'Ophtalmologie. Histological methods for preparing eye specimens do not differ greatly in the various laboratories, yet it is always instructive to see what methods one with large experience has found to be best, especially when the author believes that simple methods often give the best results. Of particular interest is the description of methods of impregnation, both metallic and vital. Rapid identification of bacteria is an important chapter. Finally, attention should be drawn to the technique of complete analysis of the aqueous humor by the method of "microdosage," and the reaction of colloidal benzoin taken from the method used in the study of the cerebrospinal fluid.

The description of the various methods is concise and the technique is clearly stated. The author is to be congratulated upon the successful solution of her task.

A. K.

V.—**Les Syndromes Hémianopsiques dans le Ramollissement Cérébral** (Hemianopsia in Cerebral Softening), by DR. SUZANNE SCHIFF-WERTHEIMER, chef de Clinique des Quinze-Vingts, p., 160, with 38 illustrations and 2 colored plates. G. Doin & Cie., Paris. Price Fr. 30.80.

This is a study of homonymous hemianopsia of definite character depending on vascular lesions of the brain. It is

part of an investigation carried on by Professor Foix and his pupils to establish a nervous semeiology based on the blood supply of the brain. Brain softening is selected for this purpose as it illustrates best the important vascular syndromes. The first part treats of the blood supply of the intracerebral optic paths after describing its normal anatomy. A chapter is devoted to the recognition of forms and objects in the peripheric visual field. The hemianopic syndromes are then taken up as they occur in lesions of the posterior cerebral, Sylvian and anterior choroidal vessels. In a final chapter the author describes a case of cortical blindness due to disseminated intracerebral foci of sclerosis, to the vascular origin of which Foix has just drawn attention. Conclusions and a bibliography are appended.

The text is adequately illustrated by excellent drawings and there are reports of many personally made clinical and pathologic observations. The author has made a valuable contribution to an important subject of interest to ophthalmologists as well as to neurologists.

A. K.

VI.—**A Manual of Normal Physical Signs,** by DR. W. B. BLANTON, Richmond, Va., pages 215. The C. V. Mosay Co. St. Louis. Price $2.50.

A knowledge of normal physical signs is necessarily presupposed in the recognition of pathologic signs; they are sometimes omitted in text-books on physical diagnosis as taken for granted. Dr. Blanton's book is written to supply this want. The text is clear, the arrangement is good; in short, the book admirably fulfils its purpose.

A. K.

VII.—**Readings in Abnormal Psychology and Mental Hygiene.** Edited by W. S. Taylor, with an introduction by Joseph Jastrow. 789 pages. 1926. D. Appleton and Co., New York. Price $4.00.

This book is a compilation of more than two hundred selections from the leading authors on abnormal psychology, skillfully arranged in logical sequence and interspersed with appropriate editorial comments so as to form a comprehensive whole

covering practically the entire subject of abnormal psychology in a manner that could not be accomplished by a single author. It is a scientific, up-to-date presentation of this important subject, as opposed to the older psychology of a quarter of a century ago. In this connection it is refreshing to note a healthy reaction against the narrow, and ofttimes repulsive, Freudian interpretation of dreams so popular only a few years back. Its comprehension presupposes a thorough knowledge of the anatomy and physiology of the central nervous system and of elementary psychology. It should be especially helpful to students of sociology and as an introduction to the study of psychiatry. I know of no book by a single author that can give the student so comprehensive a knowledge of this subject.

A. H. T.

NOTICES.

Announcement of the Fourth Postgraduate Course in Ophthalmology, Vienna, 1927.

The fourth special course for postgraduate study in ophthalmology will be given between Oct. 1st and Dec. 6th, 1927, under the auspices of the American Medical Association of Vienna at the I. and II. Eye Clinic of the Allgemeines Krankenhaus, Vienna, Austria.

This intensive postgraduate instruction was first originated in Vienna in 1922 as a result of a suggestion by Dr. Edward Jackson of Denver to Prof. E. Fuchs. Prof. E. Fuchs is kind enough to participate in the program. Prof. Meller, chief of the I. Eye Clinic, has again consented to take an active part. The other lectures will be given by Prof. Lauber, Prof. Lindner, the Docents A. Fuchs, Bachstez and Guist and Assistants Dr. Pillat, Dr. Safar, Dr. Urbanek and Dr. Nitsch. Professors, Docents and Assistants of other departments will deliver lectures in their respective subjects: Prof. Schüller on Röntgen-rays; the Docents Hirsch on the hypophysis and sinuses; Kofler on the modified West-operation; Kumer on radium-treatment; Fuhs on skin-diseases in connection with the eye, and Assistant Sternberg on embryology.

The course has been so arranged that the field can be covered systematically and comprehensively in the allotted time. A preliminary knowledge of ophthalmology is presupposed.

Concerning operations and use of slit-lamp, only lectures with demonstrations will be given. There will be an opportunity, however, for small groups of men to do practical work in these fields in both eye clinics at the current fees. In refraction only advanced work will be given. During the

first three weeks of the course an opportunity will be given for beginners to take elementary refraction with one of the teachers at the current fees. In ophthalmoscopy the non-electric ophthalmoscope will be used.

In ophthalmoscopy and practical microscopic work as well as in skiascopy with cylinders, a second teacher will attend.

The entire course is given in English for a minimum of ten and a maximum of sixteen men. The fee is $240 per man. Applications with a certified check for $50 should be sent to Docent A. Fuchs, Vienna, VIII., Skodagasse 13. Applications are accepted in order of priority.

The Meeting of the German Ophthalmological Society for this year will take place in Heidelberg on June 9, 10, 11.

A course on Ocular Biomicroscopy with the Slit-lamp will be given at the Ophthalmological Clinic of Nancy from June 13th to 18th, 1927, by Dr. Jeandelize and Dr. Koby (Basle). The course is limited to 24. The price is Fr. 1000.

The American Board of Ophthalmic Examiners will hold an examination at the Episcopalian Hospital, Washington, D. C., on Tuesday, May 17th, at the time of the American Medical Association meeting.